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Literature references in [ ] refer to the *Review of Applied Mycology*.
Map references are to the C.M.I. distribution maps of plant diseases.

Results of 1955 fungicide tests.—*Agric. Chemic.*, 11, 4, pp. 57–58, 60–61, 63; 5, pp. 52, 55, 57; 6, pp. 56–57, 59–61, 139, 1956.

In this report [cf. 35, p. 378], which follows the pattern of previous years, the American Phytopathological Society summarizes the results of trials of numerous fungicides on crop plants, carried out in the United States and Canada. Data from 99 contributors are presented and 53 tables of results included.

POLYAKOV (I. M.) & SHUMAKOVA (Mme A. A.). Эффективность препарата динитроортокрезола в борьбе с инфекционным началом грибных заболеваний растений. [Effectiveness of the preparation dinitro-orthocresol in the control of infectious sources of fungus diseases of plants.]—*Trud. vsesoyuz. Inst. Zashch. Rast.* 3, pp. 178–190, 1951. [Received 1956.]

In laboratory and field trials in the U.S.S.R. from 1947 to 1949 the preparations selinon and elgetol at 0·5 per cent. proved highly toxic to the overwintering stage of *Venturia inaequalis* on apple [35, p. 907] when applied early in the spring but not in the autumn.

Selinon was highly toxic to *Deuterophoma tracheiphila* on lemon [see above, p. 468]. Spraying the remains of infected branches and shoots on the ground with a 5 per cent. solution of selinon prevented pycnidial formation. Toxicity to the leaves was dependent on the period of contact, which involved the frequency and intensity of rainfall.

Infection of winter wheat by *Puccinia triticina* [see above, p. 462] was reduced from 58 (untreated) to 26 per cent. by two sprays of 0·5 per cent. selinon in late autumn and early spring. One application in the summer reduced the disease from 31·2 (untreated) to 10·3 per cent. and one in late autumn from 58 to 28·7 per cent.

ALTMAN (J.) & BACHELDER (S.). **Susceptibility of some ornamental and vegetable plants to streptomycin injury.**—*Plant Dis. Reptr*, 40, 12, pp. 1081–1083, 1956.

In greenhouse experiments in 1955 at the Department of Plant Pathology, Rutgers University, New Brunswick, New Jersey, injury to ornamentals and vegetables caused by streptomycin nitrate varied with the kind of plant, concentration of the antibiotic (200 to 3,200 p.p.m.), presence of a cuticle penetrant, and number of sprays (up to four). Thus, ivy, *Peperomia crassifolia*, and [chilli] pepper were highly tolerant of single or successive applications, while *Pelargonium hortorum*, maize, and Bountiful bean (*Phaseolus vulgaris*) were sensitive to the antibiotic at concentrations exceeding 400 p.p.m., even a single spray. Injury took the form of bleaching or the development of yellow patches on the leaves; in maize the bleached areas became necrotic when 800 to 3,200 p.p.m. were used.

The addition to the sprays of 1 per cent. methyl cellosolve [34, p. 602] increased injury.

GOTTLIEB (D.). **The effect of metabolites on antimicrobial agents.**—*Phytopathology*, 47, 2, pp. 59–67, 1957.

In this study from the University of Illinois, Urbana, the writer surveys, with 57 references, the interactions of a large number of toxicants with various metabolites in the light of the effect of these toxicants on bacteria and fungi. He concludes that the types of detoxication that can result may be placed in a number of classes. The toxicant may combine chemically with one or more metabolites, as when sulphhydryl compounds combine with heavy metals or with certain antibiotics. The toxicity of the metallic cation may be destroyed by the formation of a complex or chelate between the cation and an amino acid. A chemical compound structurally resembling an essential component of an enzyme system can replace a metabolite in the cell and prevent various cell functions, a form of competitive antagonism by which the action of a germicide may be nullified by many metabolic substances. Alternatively, the metabolite may only supply the end product of a reaction or chain of reactions with which the inhibitor interfered. In some instances the production by the organism of substances that change the pH of the medium may bring about detoxication, while in others it may be due to oxidation-reduction effects. Finally, enzyme action may be responsible for inactivation by causing changes in the toxic molecule.

Distinct from the above reactions there are also: (1) 'proximity effects', by which the locus on or in the cell at which the inhibitor is to act is altered; (2) the protective action of lecithin on pathogens; and (3) displacement effects when the toxin may be displaced by a relatively innocuous compound. Organisms resistant to a particular chemical might differ from those sensitive to it by producing a large amount of metabolite, the excess of which over the metabolic needs could inactivate the toxicant.

KUHFUSS (K.-H.). **Beitrag zur Methodik der Fungizidprüfung von Naß- und Trockenbeizmitteln.** [Contribution to the technique of the fungicidal assay of liquid and dry preparations.]—*Phytopath. Z.*, 28, 3, pp. 281–284, 1 fig., 1957.

At the Plant Breeding Institute, Bernburg, Germany, the author developed a method for the assay of fungicides based on a combination of Forsberg's [28, p. 399] and Jakeš's (*Chron. bot.*, 4, p. 515, 1938), in which cotton threads are used as carriers of the chemicals and nutrient agar for the fungus. Using *Phoma lini* and *Botrytis cinerea* on malt agar plates at 26° C., the zones of inhibition produced by 0·3 per cent. germisan solution and germisan dust were clearly visible after three days' incubation, the former giving a much wider zone.

SIJPESTEIJN (A. K.) & VAN DER KERK (G. J. M.). **Investigations on organic fungicides. X. Pyruvic acid accumulation and its relation to the phenomenon of inversion growth as effected by sodium dimethyldithiocarbamate.**—*Biochim. biophys. Acta*, 19, pp. 280–288, 1 fig., 6 graphs, 1956. [French and German summaries.]

In a further contribution to this series of studies [cf. 35, p. 310] at the Institute for Organic Chemistry, Utrecht, the Netherlands, it was found that in liquid and agar media containing sodium dimethyldithiocarbamate (NaDDC) in concentrations which invert its inhibitory action on spore germination and mycelial growth of *Aspergillus niger* and *Penicillium italicum* [loc. cit.] pyruvic acid accumulates in the presence of both mycelium and ungerminated spores. High ammonia concentration (0·5 per cent. ammonium sulphate) favoured inversion growth and pyruvic acid accumulation.

Since α-keto acids are strong antagonists of the action of NaDDC on *A. niger* it is believed that this pyruvic acid accumulation is the active factor causing inversion growth, which is not considered to be explicable on purely physico-chemical grounds, but rather to be the outcome of the action of the fungicide on the metabolism of the fungus, possibly by interfering with one of the co-enzymes that plays a part in pyruvate oxidation.

Ross (R. G.) & Ludwig (R. A.). **A comparative study of fungitoxicity and phytotoxicity in an homologous series of N-n-alkylethylenethioureas.**—*Canad. J. Bot.*, 35, 1, pp. 65–95, 3 pl., 13 graphs, 1957.

At the Canada Department of Agriculture, London, Ontario, the fungitoxicity within a homologous series of N-n-alkylethylenethioureas [see above, p. 454] ranging from ethyl to dodecyl was determined against spore germination of *Monilinia* [*Sclerotinia*] *fructicola* and *Alternaria solani*. As the alkyl side chain increased in length so water solubility decreased and the oil-to-water partition coefficient increased. An increase of fungitoxicity up to and including the octyl homologue was then followed by a sharp decline due to limiting water solubility.

Phytotoxicity to various seedlings and growing plants reached a maximum according to the availability of the compounds to the plant cells, but mobility in the plant decreased up the series. The phytotoxicity of compounds readily available increased at least up to the octyl homologue, but with barriers present, a peak occurred near the amyl.

Uptake from aqueous solutions of the compounds by potato tissue and spores of *S. fructicola* indicated a distribution equilibrium between these and the external solution. As the side chain lengthened the affinity for the biophase increased so that the differential toxicity could be attributed to partition of the chemical between the two phases.

Zentmyer (G.) & Rich (S.). **Reversal of fungitoxicity of 8-quinolinol and copper-8-quinolinolate by other chelators.**—Abs. in *Phytopathology*, 46, 1, p. 33, 1956.

The fungitoxicity of 8-quinolinol and copper-8-quinolinolate to spores and mycelium of *Aspergillus niger* and mycelium of *Botryosphaeria ribis* was reversed on Czapek's agar by L-cysteine (at 0·5 per cent.), the action of the former fungicide also being reversed to a lesser extent by casein hydrolysate and L-histidine [cf. 35, p. 310]. Quinaldic acid and dithizone reversed the toxicity of 8-quinolinol to *Stemphylium sarciniforme* spores. Apparently these chelators act by removing the copper or preventing any from reaching the 8-quinolinol.

Byrde (R. J. W.) & Woodcock (D.). **Effect of the interaction between chelating agents on their fungitoxicity.**—*Nature, Lond.*, 179, 4558, p. 539, 1957.

In work at Long Ashton Research Station, Bristol, the authors examined the action of a series of 5-*n* alkyl oxines (added at 10^{-4} *M*) on *Aspergillus niger* [see preceding abstract] grown on glucose mineral salts agar medium (free from added trace metals). Growth at 25° C. was assessed over the two- to four-day period after inoculation. The activity of the compounds rose to a maximum at a chain length of five or six carbon atoms. In another experiment the addition of copper $^{2+}$ at 10^{-4} *M* markedly reduced the activity of 5-*n* amyl and 5-phenyl oxine at the same concentration, the effect being reversed by the addition of the disodium salt of ethylenediamine tetraacetic acid at 10^{-3} *M*, which presumably liberated the free oxines [loc. cit.]. Oxine itself, by contrast, was active in the presence of copper $^{2+}$ and inactive with excess ethylenediamine tetraacetic acid, though neither of these additives reduced growth significantly in the absence of oxines.

Owing to their greater lipoid solubility, unchelated molecules of 4-amyl and 5-phenyl oxines are able to penetrate the fungus wall more rapidly than those of

oxine. It is suggested that the decrease in the activity of the two oxines in the presence of copper may arise from too low an aqueous solubility of the corresponding 1:2 copper:oxine complexes.

Other experiments indicate that excess ethylenediamine tetraacetic acid in the basal medium causes a significant increase in the fungistatic activity of a number of compounds, including 5:7-dichloro-oxine at 10^{-5} *M* and 2-mercaptobenzthiazole (10^{-4} *M*).

Bessey (E. A.). **Mycology.**—*ex* A Century of Progress in the Natural Sciences, 1853–1953, pp. 225–265, 3 pl., San Francisco, California Academy of Sciences, 1955. [Received 1957.]

After a brief introduction the author reviews the history of mycology during the past century [cf. next abstract], the main sections of the paper dealing with the structure and life-history of fungi; taxonomy; centres of mycological work in different parts of the world; mycological work in North America; centres of advance (where progress at some period was especially rapid); periodicals; and classification systems. A reference list of 196 titles is appended.

Weston (W. H.). **Mycology during the past fifty years.**—*Amer. J. Bot.*, 44, 1, pp. 82–87, 1957.

In this paper, delivered at the Golden Jubilee Symposium of the Botanical Society of America at the University of Connecticut, the author surveyed the notable contributions of fungi to the advances in botany in the past 50 years [see preceding abstract], particularly in relation to their simple form, their physiological reactions, and utilization in morphogenetic investigations. The author finally touched on the growth of medical mycology.

Pinto-Lopes (J.) & Ré (L.). **Mycological abstracts (covering the whole Portuguese mycological literature).**—13 pp., Departamento de Micologia, Instituto Botânico, Faculdade de Ciências, Lisboa, 1954; ibid., 8 pp., 1955.

In each of these publications [cf. 34, p. 799] Part II (pp. 11–13 and 7–8, respectively) contains English summaries of papers which appeared in the year concerned. Six papers are dealt with in all.

Naumov (N. A.). О проблеме заболеваний растений. [The problem of plant diseases.]—*Trud. vsesoyuz. Inst. Zashch. Rast.* 3, pp. 115–124, 1951. [Received 1956.]

Problems arising from new disease occurrences are discussed with frequent reference to the literature, accompanied by a brief survey of the diseases recorded (including new hosts and wider distribution) during the present century in Europe and in the U.S.S.R.

Vlodavets (V. V.). Плесневые грибы в атмосферном воздухе Москвы. [Mould fungi in the atmospheric air of Moscow.]—Природа [*Nature, Moscow*], 45, 12, pp. 95–97, 2 figs., 1 graph, 1956.

With the help of Krotov's apparatus and Koch's agar plate method a survey was carried out in 1955 of the mould fungi occurring in the air (1 m. 20 cm. above ground) in Moscow, U.S.S.R. The fungi most frequently found were *Cladosporium* (54·9 per cent. of the 8,766 colonies obtained), *Penicillium* (10·4), *Alternaria* (7), and *Aspergillus* (3·8). During the winter months (December to March) *Penicillium* and *Aspergillus* were predominant, with *Cladosporium* reduced to between 1·01 and 8·9 per cent. of the total mould fungi, whereas it constituted 39·8 to 69·5 per cent. during the rest of the year. *Penicillium* spp. were fairly evenly distributed (30·4 to 47 per cent.) though they were considerably fewer in number than the

other moulds from May to November, inclusive, when they totalled 2·4 to 18·6 per cent. The percentage of *Alternaria* was 0·5 to 1·7 from December to May and 4·5 to 18·3 from June to November.

CALPOUZOS (L.), THEIS (T.), & RIVERA BATLLE (CARMEN M.). **Culture of the rust parasite, Darluca filum.**—*Phytopathology*, 47, 2, pp. 108–109, 1957.

In co-operation with the United States Department of Agriculture, Beltsville, the writers, working at the Puerto Rico Experiment Station, succeeded in culturing *Darluca filum* [cf. 34, p. 141] from eight rust species on water agar, and transferring germinated spores to potato dextrose or soy-bean extract agar. Out of 121 seemingly mature pycnidia 62 had no viable spores, 27 gave 1 to 50 per cent. germination, 10 gave 51 to 70, and 22 gave 71 to 100. Morphological changes, which were maintained, occurred in some cultures. The continued pathogenicity of one isolate to *Uromyces leptodermus* was demonstrated after four months in culture.

LEDOCHOWSKI (J. S. M.). **Sobre las técnicas de conservación de cultivos de micro-organismos.** [On the methods of preservation of cultures of micro-organisms.] —*An. Inst. Invest. agron., Madr.*, 5, pp. 183–194, 3 pl., 1956.

Among the 106 fungi and bacteria used in experiments to compare the viability of cultures maintained in (*a*) garden soil and (*b*) on Czapek's and other nutrient media under paraffin oil [33, p. 245] were 44 moulds (mostly fungi imperfecti and yeasts). Many survived for over two years.

TURIAN (G.). **Exaltation de l'activité phosphatasique dans le latex d'Euphorbia verrucosa L. parasitée par Uromyces scutellatus (Schr.) Lév. Ses relations avec le métabolisme auxinique.** [Enhancement of phosphatase activity in the latex of *Euphorbia verrucosa* L. parasitized by *Uromyces scutellatus* (Schr.) Lév. Its relations with the auxinic metabolism.]—*Phytopath. Z.*, 28, 3, pp. 275–280, 1957. [German and English summaries.]

At the Institute of General Botany, University of Geneva, Switzerland, the content of free inorganic phosphorus in the latex of *Euphorbia verrucosa* parasitized by *Uromyces scutellatus*, which induces the same symptoms on its host as does *U. pisi* on *E. cyparissias* [33, p. 312], was shown by colorimetric determination to be double that of healthy plants (10·8 as compared with 5·2 mg. per gm.). After 90 minutes' incubation at 37° C. the quantities of phosphorus liberated by phosphatase activity were 33·5 in diseased and 15·8 mg. in healthy tissues.

The addition of 10^{-3} M heteroauxin to the healthy latex stimulated its phosphatase activity, suggesting an interaction between the growth substance and phosphatase content in rusted plants. A correlation is further indicated between excessive phosphatase activity and flower sterilization in the two above-mentioned cases of rust on *E.* spp.

FEDORINCHIK (N. S.). Роль антагонистов в подавлении заразного начала возбудителей болезней, передающихся через почву. [The role of antagonists in controlling infectious sources of causal agents of soil-borne diseases.]—*Trud. vsesoyuz. Inst. Zashch. Rast.* 3, pp. 69–73, 1 diag., 1951. [Received 1956.]

In investigations in the U.S.S.R. *Trichoderma lignorum* [*T. viride*] was antagonistic in culture on several media to a number of fungi, including *Rhizoctonia* [*Corticium*] *solani*, *Sclerotinia libertiana* [*S. sclerotiorum*], *Helminthosporium* and *Alternaria* from wheat, *Phoma betae*, *Moniliopsis aderholdi*, *Ascochyta pisi*, *Colletotrichum lini* [*C. linicola*], *Botrytis cinerea*, *Verticillium lateritium*, *Fusarium* sp. from flax, and *Phytophthora infestans*.

Spencer (D. M.), Topps (J. H.), & Wain (R. L.). **Fungistatic properties of plant tissues. An antifungal substance from the tissues of Vicia faba.**—*Nature, Lond.*, 179, 4561, pp. 651–652, 1 fig., 1957.

In further studies by the Agricultural Research Council Systemic Fungicide Unit, Wye College, using the plate technique already described [36, p. 42], segments of stem and root of broad bean seedlings markedly inhibited the spores of *Aspergillus niger*, the zone of inhibition being about 1 cm. in diameter. The greatest activity occurred in the lower part of the stem and the upper segments of the primary root. The antifungal substance was present in smaller amounts in mature plants. In immature seeds assayed immediately after removal from the pod activity was centred in the cotyledons. All the 11 varieties of broad beans tested possessed this antifungal property, a smaller but similar activity being found in corresponding tissues of runner bean (*Phaseolus multiflorus* [*P. coccineus*]) and pea. No activity was exerted by expressed sap or tissue extracts, in fact certain fractions of stem tissue extracts stimulated the growth of *A. niger*. The antifungal constituent was obtained from stem tissue by placing it on agar and putting cylinders of this treated agar on the test plate. The active substance from ten to 12 plants was concentrated to a brown, gummy material, from which a clear zone 11 to 13 mm. in diameter was obtained. The germination of *Botrytis cinerea* spores was totally inhibited by a concentration equivalent to 120 plants per ml.

Among the properties of the antifungal substance are activity against *B. fabae*, *Alternaria solani*, and *Monilia* [*Sclerotinia*] *fructigena*. It is phenolic in nature but not a tannin. Some evidence has been obtained that the substance is not present in intact broad bean plants but is produced in the tissues in response to wounding.

Topps (J. H.) & Wain (R. L.). **Fungistatic properties of leaf exudates.**—*Nature, Lond.*, 179, 4561, pp. 652–653, 1957.

Included in studies at Wye College on naturally occurring fungistatic substances was an investigation of the resistance of some woodland trees to fungal pathogens.

The washings of green leaves of 12 species collected in October, 1953, and June, 1954 and 1955, were tested for activity against *Botrytis cinerea* spores. Dilute washings had no effect, but when concentrated by ether extraction exudates of leaves from ash [cf. 36, p. 113], beech, chestnut, elder, *Robinia pseudacacia*, hazel [*Corylus avellana*], horse chestnut, oak, plane (*Platanus acerifolia*), privet, ivy, and yew retarded the growth of *B. cinerea* germ tubes [cf. preceding abstract]. The greatest effects were obtained from extracts of elder and privet.

Naito (N.) & Tani (T.). **An antibiotic isolated from culture filtrates of Gloeosporium olivarum grown on media containing 2, 4-D.**—*Jap. J. Bot.*, 15, 2, pp. 152–163, 3 figs., 3 graphs, 1956.

This is a full account in English of work already noticed from English summaries of papers in Japanese [cf. 35, pp. 703, 916]. The antibiotic isolated inhibited growth of a number of phytopathogenic fungi and bacteria as well as that of *Gloeosporium olivarum*.

Picci (G.). **Gli antibiotici in alcuni aspetti dell'agricoltura.** [Antibiotics in certain phases of agriculture.]—*Agricoltura ital.*, 56 (N.S. 11), pp. 32–56, 1956.

In the first part of this paper the author discusses the place of antibiotics in plant pathology [36, p. 260], the main points covered being their behaviour in the soil, their use as phytotherapeutants, and the effects they exert on phytopathogenic bacteria and fungi. In the second part antibiotics are considered as growth substances. The list of references comprises 108 titles.

Koaze (Y.), Sakai (H.), Yonehara (Y.), Asakawa (M.), & Misato (T.). **Studies on the activities of antibiotics against plant pathogenic microorganisms.**—*J. Antibiot.*, Ser. A, 9, 3, pp. 89–96, 1956.

In this joint contribution from the Faculty of Agriculture and the Institute of Applied Microbiology, University of Tokyo, and the National Institute of Agricultural Sciences, Tokyo, Japan, the results of *in vitro* tests of some 40 antibiotics against 15 plant-pathogenic fungi and five bacteria are described and tabulated. Effective against both classes of organisms were actinomycin J, aureothricin, blastcidins B and C (geodin), suranomycin (nitropsin), thiolutin [33, pp. 618, 738], and estin. Within this group, aureothricin and thiolutin were characterized by specially powerful activities and broad antibiotic spectra. For instance, the minimum concentration (in μgm. per ml.) of aureothricin required to inhibit *Alternaria kikuchiana*, *Cladosporium fulvum*, *Fusarium lini*, *Gibberella fujikuroi*, *G. saubinetii* [*G. zeae*], *Gloeosporium kaki*, *Glomerella cingulata*, *G.* [*Colletotrichum*] *lagenarium*, *Sclerotium bataticola* [*Macrophomina phaseoli*], *Ophiobolus miyabeanus*, *Sclerotinia arachidis*, *Pseudomonas solanacearum*, *Xanthomonas citri*, and *X. pruni* was 10: *Elsinoe ampelina*, *E. fawcetti*, and *Colletotrichum lindemuthianum* < 1. Thiolutin at a strength of 10 μgm. per ml. inhibited *A. kikuchiana*, *Cladosporium fulvum*, *Gibberella zeae*, *M. phaseoli*, *Piricularia oryzae*, *X. citri*, and *X. pruni*, and was effective against *E. ampelina*, *E. fawcetti*, *C. lindemuthianum*, *Ophiostoma* [*Ceratocystis*] *fimbriata*, and *P. oryzae* at <1.

Active against certain fungi only were blastcidin A, eurocidin, rimocidin [loc. cit.; 36, p. 268], and trichomycin, while chlorotetracycline [aureomycin], grasseiromycin, oxytetracycline [terramycin], polymyxin B, and tetracycline were exclusively bacteriostatic.

Resistance to the influence of many of the antibiotics tested was characteristic of *F. lini*, *Gibberella fujikuroi*, *G. zeae*, and *Erwinia aroideae*, while *C. fimbriata*, *Elsinoe ampelina*, *E. fawcetti*, *P. oryzae*, *X. citri*, and *X. pruni* were sensitive to their action.

Rangaswami (G.). **In vitro effect of mycothricin on plant pathogenic bacteria and fungi.**—*Mycologia*, 48, 6, pp. 800–804, 1956.

In studies at the Institute of Microbiology, Rutgers University, New Jersey, mycothricin [36, p. 203] displayed activity *in vitro* against a number of plant pathogens. The minimum inhibitory concentration for the bacteria ranged from 0·5 (*Erwinia atroseptica*) to 25 μgm. per ml. (*Bacterium stewartii* [*Xanthomonas stewarti*]). The LD_{50} values for spore germination of *Alternaria oleraceae* [*A. brassicicola*] and *Sclerotinia fructicola* were 3·1 and 0·7 μgm. per ml., respectively.

Hidaka (Z.) & Murano (H.). **Studies on the streptomycin for plants. I. Behaviour of Pseudomonas solanacearum and Ps. tabaci treated with streptomycin in vitro and surface absorption of streptomycin in the plant.**—*Ann. phytopath. Soc. Japan*, 20, 4, pp. 143–147, 1956. [Japanese, with English summary.]

Streptomycin at 0·3 μgm. per ml. of water inhibited and subsequently killed *Pseudomonas solanacearum* [cf. 35, p. 384]; 1 μgm. per ml. inhibited *P. tabacum* [cf. 36, p. 137], and 5 μgm. per ml. killed both bacteria at once. On tobacco plants the lower leaf surface absorbed twice as much streptomycin as the upper, but addition of 0·1 per cent. tween 20 increased absorption and reduced the difference between the two surfaces. The stronger the streptomycin solution the more was absorbed, but more than 275 μgm. per ml. caused transitory chlorotic spotting of the lower leaf surface [cf. above, p. 487]. Maximum absorption occurred eight hours after spraying.

Das Gupta (S. N.). **Air pollution in relation to plant diseases.**—*Curr. Sci.*, 26, 1, pp. 8–9, 1957.

In his presidential address to the section of Botany at the 44th Session of the

Indian Science Congress, January, 1947, the author discussed research on air pollution in relation to plant diseases [cf. next abstract], making special reference to the increasing importance of this problem with the expansion of industry in India.

Buchwald (N. F.). **Røgskade på planter.** [Smoke damage to plants.]—*Ingeniøren, 1956*, 6, pp. 152–153, 2 figs., 1956.

Useful information is summarized on the damage caused to vegetation through atmospheric pollution by sulphur dioxide and other factory fumes, notably in the extensive industrial areas of Europe, including Belgium, Czechoslovakia, England, and Germany (Silesia and Wesphalia), and of the United States [36, p. 48]. The subject is discussed from various angles, including external (acute and chronic) and internal symptoms; effects on physiological processes, especially assimilation; varying susceptibility of different categories of plants; solid particles in smoke; 'smoke-sick' soils; diagnosis of atmospheric pollution by air analysis, observation of symptoms, and use of 'indicator' plants; and control, primarily by rendering the fumes innocuous, e.g., through the conversion of sulphur dioxide to sulphuric acid.

Spicher (G. S.). **Keimzahl und Zusammensetzung der Keime bei handelsüblichen Stärken.** [Germ number and the germ composition of commercial starches.]—*Stärke*, 8, 5, pp. 118–123, 1956. [English summary.]

In a study of the microfloras of starch from various sources [cf. 36, p. 91], undertaken at the Federal Research Centre for Central Processing, Detmold, Germany, starch samples were shaken in sand and distilled water before inoculating aliquot portions into various media. The work was intended principally to detect bacteria and classify them according to their ability to utilize starch, but the populations of [unspecified] moulds were also determined. For maize, potato, rice, and wheat starches these were, respectively, 60, 30, 17 and 3,660 spores per gm. A comparison of wheat with starch prepared from it revealed a marked increase in bacteria and a marked reduction in fungal contamination, resulting from the processing.

Rose (G. R. F.), Mitton (M.), Gardner (J. B.), Laird (D. M.), & Bayley (C. H.). **The detection of fungal growth in cellulosic textiles.**—*Text. Res. J.*, 27, 2, pp. 99–110, 1957.

At the National Research Laboratories, Ottawa, Canada, a modification of the Pianese IIIb staining test has proved useful in the detection of [unspecified] fungal hyphae in or on cotton, flax, viscose rayon, jute, sisal, and hemp fibres [10, p. 310]. The procedure causes scarcely any swelling and therefore does not impair the structure of the fibres, nor is it appreciably affected by the presence of dyes in the material. The stain is specific for microbiological damage. It should be of great assistance in the routine examination of cellulose fibres subjected to fungal contamination in the later stages of growth or during harvesting, as in the case of cotton, or in the course of fibre separation processes involving microbiological action, e.g., the retting of flax.

Boidin (J.) & Prévot (J.). **Les Aspergillus rencontrés en tannerie. Leurs actions.** [The Aspergilli found in tanneries. Their effects.]—*Bull. Ass. franç. Chim. Cuir*, 18, 2, pp. 47–72, 5 figs., 5 graphs, 1957.

At the Institut de Recherches pour les Industries du Cuir, Lyon, France, the effect of 14 species of *Aspergillus* recorded on leather [35, p. 702] was studied. The fungi were grown on a solid starch-tannin medium containing potato, yeast extract, malt (maltea Moser), and mineral salts with a 10 per cent. solution of pyrogallic tannin [34, p. 212] purified with added alcohol. *A. niger* grew most rapidly, with *A.*

oryzae and *A. flavus* next; all the other species tested were retarded by the presence of tannin. The experiments were carried out, however, over a period of only ten days at laboratory temperature, and some species tested, including *A. fumigatus* and *A. terreus*, are known to exert their optimum effect at about 40° C.

Qualitative tests were then made on tanning fluids (pyrogallic tannins) by chromatography. In Freudenberg's basic medium vitamin B_1 was replaced by a B complex, becozyme Roche. *A. niger* attacked the tannins most strongly, followed by *A. flavus*; less active in descending order were *A. terreus*, *A. unguis*, *A. fumigatus*, *A. ochraceus*, and *A. amstelodami*.

Quantitative tests on the tannins gave the same order of classification. *A. niger* rapidly broke down tannin and gallic acid, even at an initial concentration of 10 per cent. *A. flavus* liberated large quantities of gallic acid, but decomposed it much more slowly. The effect of *A. terreus* was appreciable in a solution containing 5 per cent. tannin, but was more rapid in one of 1 per cent. Attack by *A. unguis* and *A. amstelodami* was detectable in 5 per cent., but that of *A. ruber* was weak, even in 1 per cent.

To determine the effects of the fungi on fatty substances, a solution of cod-liver oil coloured with Nile blue indicator was emulsified in an agar medium. All the species tested grew well, but only *A. flavus* and *A. ochraceus* caused visible hydrolysis of the oil.

When grown on a 0·01 per cent. solution of maltea solidified with 10 per cent. gelatin, most of the strains liquified the gelatin, *A. flavus* being most active. Members of the *A. glaucus* group and *A. niger* had no effect.

The fungi were then grown on pieces of leather tanned with quebracho or chestnut. Conical flasks containing dry calcium chloride covered with hydrophilous cotton were placed in an oven at 55° and the test-pieces, dipped for one minute in 95 per cent. alcohol, were placed in them. After six hours in an oven submitted to infra-red rays at 55°, the flasks were transferred to an ordinary oven at the same temperature. The strips were then tested on malt agar (0·01 per cent. solution of maltea in 1·5 per cent. agar) streaked with the test organisms. After one week *A. niger*, *A. flavus*, *A. amstelodami*, *A. ochraceus*, and *A. candidus* had made distinct growth and the test pieces could be placed on the cultures, but it was necessary to wait three weeks before using *A. terreus* and *A. versicolor*. Growth was estimated by the area of leather covered by the mould after four weeks, on a scale 0 to 4, 0 representing no growth, 1 a growth covering about one quarter of the surface and 4 the entire surface. On this basis the scores were: *A. niger* 4, *A. flavus* 4, *A. terreus* 4 (all making abundant growth), *A. amstelodami* 1·3, *A. versicolor* 0·6, *A. ochraceus* 1, and *A. candidus* 1·3. After the mould had been wiped away it was seen that *A. niger* had caused dark spots in the leather, the other fungi producing spots of a lighter shade.

Attention is drawn to the appreciable destruction of fats by *A. flavus* and to the fact that *A. niger* and *A. flavus*, which usually attack tannin severely, scarcely affect it when it is fixed in leather. These results agree, in practice, with those obtained by Musgrave and his collaborators in 1951 [30, p. 576].

Orsenigo (M.). **Produzione di tossine da parte di Helminthosporium oryzae Breda de Haan. Parte II.** [The production of toxins by *Helminthosporium oryzae* Breda de Haan. Part II.]—*Ann. Sper. agr.*, N.S., 10, 6, pp. 1809–1839, 1 pl., 1 fig., 7 graphs, 1956. [English summary.]

In further studies on the production of toxins by *Helminthosporium oryzae* [*Ophiobolus miyabeanus*] in culture [36, p. 423], the effects of different sources and concentrations of carbon and nitrogen, of the pH value of the medium, of the age of the culture, and of temperature were investigated, and the optimum conditions for the growth of the fungus and the production of toxins established. Evidence

was obtained of a certain antagonism between growth and toxin production, the latter very often being greatest when mycelial formation was least. Different strains of the fungus gave different amounts of toxin under various conditions. It was found possible to extract the toxin from the culture filtrates with chloroform; chromatographic analysis demonstrated the presence of at least two components, one of which was inactive.

Bergemann (J.). **Die Mykorrhiza-Ausbildung einiger Koniferen-Arten in verschiedenen Böden.** [Mycorrhiza development in some conifer species in various soils.]—*Z. Weltfw.*, 18, 5–6, pp. 184–202, 7 pl. (2 col.), 2 graphs, 1955. [English summary.]

Seeds of pine (*Pinus sylvestris* and *P. patula*), spruce (*Picea excelsa* and *P. sitchensis*), and larch (*Larix decidua* and *L. leptolepis*), potted in (*a*) sandy soil from treeless wasteland, (*b*) arable soil, and (*c*) a mixture of soils from coniferous woodland, were compared with respect to growth and mycorrhizal development after three years in the greenhouse. The general tendency was for both mycelial development and mycorrhizal branching or forking to be sparse or absent in the sandy soil, variable though somewhat more frequent in the arable soil, and more or less abundant in the woodland soil. In sand the absence of a mycelial mantle was paralleled by very poor growth, strong tannin production, and marked intracellular infection in autumn. In arable soil the two pine species developed a mycelial mantle and grew better than the spruce and larch, which were without a mantle and grew almost as poorly as in sand. In woodland soils the growth of all species was strikingly superior.

Fushtey (S. G.). **Studies in the physiology of parasitism. XXIV. Further experiments on the killing of plant cells by fungal and bacterial extracts.**—*Ann. Bot., Lond.*, N.S., 21, 82, pp. 273–286, 5 graphs, 1957.

In a further study in this series [cf. above, p. 458] at the Imperial College of Science, London, cucumber and turnip disks were used to confirm the finding of Tribe [34, p. 667] that plasmolysed tissues were protected from the killing action of enzyme extracts of *Botrytis cinerea* and *Bacterium* [*Erwinia*] *aroideae*, while the pectolytic macerating action was essentially unaffected. Plasmolysed cells also possessed considerable immunity from the toxic action of mercuric chloride and oxalic acid. The former finding introduced the possibility that the killing and macerating actions were the work of different enzymes. Further work, however, revealed that (*a*) the cells regained their susceptibility to the killing action on recovery from plasmolysis, and (*b*) in numerous preparations, made by extracting the crude extracts of the pathogens with various proportions of acetone over a wide range of pH, the killing and macerating actions always varied together. It must, therefore, be presumed that in both organisms they are the work of one enzyme.

After partial maceration the sensitivity of the tissues to the toxic action of mercuric chloride or oxalic acid was enhanced. This was interpreted to mean that before maceration was complete the toxic principle was able to reach the surface of the protoplast.

Martin (S. M.) & Adams (G. A.). **A survey of fungal polysaccharides.**—*Canad. J. Microbiol.*, 2, 7, pp. 715–721, 1956.

In a survey of the constitutents of the polysaccharides of 31 species of fungi representing 12 genera, made at the National Research Laboratories, Ottawa, three groups of extracellular constituents were distinguished in the medium. *Mucor* and *Rhizopus* produced glucuronic acid and fucose, in addition to galactose, glucose, and mannose. Species of *Fusarium* and *Trichoderma* yielded glucuronic

acid but not fucose, while the remainder of the fungi yielded neither substance. The intracellular preparations from the mycelia comprised two groups on the basis of the presence (in *Mucor* and *Rhizopus*) or absence (the remainder) of fucose. Glucuronic acid was absent from all intracellular preparations.

It is pointed out that these results do not establish fixed patterns of polysaccharide constituents for the fungi under consideration, since changes in the growth conditions produced quantitative, if not qualitative, alterations in the constituents of the preparations.

Ramakrishnan (C. V.) & Sathe (V.). **Effect of vitamin K_3 in inducing its biosynthesis in moulds.**—*Sci. & Cult.*, 22, 6, p. 340, 1956.

Aspergillus flavus, isolated from mouldy groundnut seeds at the University of Baroda, India, is one of the moulds being used for the study of vitamin K_3 synthesis. After subculturing twice on Czapek agar containing 2 μgm. vitamin K_3 per 10 ml. it was found that a further addition of 5 μgm. increased the synthesis of the vitamin. Cultures not given the preliminary 2 μgm. were unable to synthesize vitamin K_3.

Townsend (Brenda B.). **Nutritional factors influencing the production of sclerotia by certain fungi.**—*Ann. Bot., Lond.*, N.S., 21, 81, pp. 153–166, 1957.

In further work [34, p. 262 and next abstract] at the University of Bristol a study was made of three phases of sclerotial production (initiation, development, and maturation) in *Botrytis cinerea*, *B. allii*, *Sclerotinia gladioli*, *Sclerotium rolfsii*, *S. cepivorum*, and *Rhizoctonia* [*Corticium*] *solani*, grown on a basic mineral salts medium (with or without peptone) plus a variety of alternative carbon sources at concentrations ranging from 0·5 to 3 per cent. Asparagine, potassium nitrate, and ammonium salts were satisfactory alternatives to peptone, provided that high acidity did not develop.

The initiation of sclerotia was dependent on high levels of carbon and nitrogen, and was in general favoured by the conditions favouring mycelial growth. However, although high concentrations of carbohydrate, and to a lesser extent nitrogen, favoured the initiation of large numbers of sclerotia, they retarded or entirely inhibited their maturation. Maturation begins when growth is checked by exhaustion of nutrients or some other cause. It is possible that mature sclerotia produce a substance which inhibits the initiation of others, or the early development of those already initiated, since only a proportion of the numerous initials formed reach maturity.

With *Sclerotium rolfsii* vitamin B_1 hastened the initiation of sclerotia and increased the number maturing at a given glucose concentration. The other species needed no growth substances.

Page (O. T.). **The influence of light and other environmental factors on mycelial growth and sclerotial production by Botrytis squamosa.**—*Canad. J. Bot.*, 34, 6, pp. 881–890, 3 pl., 1956.

At the Ontario Agricultural College, Guelph, a monoconidial isolate of *Botrytis squamosa* [cf. 35, p. 341] was grown on modified White's medium, which promotes rapid mycelial growth, and on Czapek's medium, which induces abundant sclerotia. Exposure of the fungus on White's medium to specific levels of incandescent light checked mycelial growth to a degree proportional to the distance of the colony from the lamp, apparently because of visible or near infra-red radiant energy or both.

On modified Capek's medium sclerotia formed abundantly over a pH range of 5·9 to 7·3, but the number varied with the carbon source employed, being abundant with D-glucose, D-mannose, and sucrose; they were abundant also with nitrate,

but not with other sources of nitrogen tested. Adequate aeration was essential for sclerotial formation. On exposure to alternating periods of darkness and radiant energy from an incandescent or fluorescent lamp, or both, concentric rings of sclerotia were formed in the light. Exposure to 10° C. for 21 hours alternating with three hours at 23° was also followed by the formation of discrete sclerotial rings.

URUYAMA (T.). **Das Wuchshormon des Fruchtkörpers von Agaricus campestris L. (Vorläufige Mitteilung).** [The growth hormone of the sporocarp of *Agaricus campestris* L. (Preliminary note).]—*Bot. Mag., Tokyo*, 69, 817–818, pp. 298–299, 3 figs., 1956.

The author reports investigations at Kyoto University, Japan, demonstrating that in sporocarps of *Agaricus campestris* one or more growth hormones produced by the gills determine the linear growth of the stipe in the active region between ring and pileus, and also the growth of the pileus itself.

STOVER (R. H.). **Behaviour of albinism in brown and gray cultures of Thielaviopsis basicola.**—*Canad. J. Bot.*, 34, 6, pp. 875–879, 1 pl., 1 diag., 1 graph, 1956.

Further studies at the University of Toronto and the Laboratory of Plant Pathology, Harrow, Ontario [cf. 36, p. 205], showed that after five to ten days growth at 73°±3° F. on potato dextrose agar and other media single-spore, grey, wild-type cultures of *Thielaviopsis basicola* produced a consistent average of 3·5 to 4·2 albino sectors, though fluctuating and higher temperatures and certain media reduced this. Mass spore transfers from albino sectors gave albino colonies with a small pigmented area round the inoculum, while single-spore cultures always reverted to the grey parent. This expression of albinism cannot be explained on the basis of a simple gene mutation, nor does the hypothesis of a variable phenotypic change, originating in the cytoplasmic enzyme system that controls pigmentation and is under constant genotypic control, give an altogether adequate explanation.

Brown cultures, on the other hand, seldom gave rise to albino sectors or patches, and when these did arise they yielded pure albino colonies morphologically identical with the parents except for the thinner chlamydospore walls, and they have remained stable for four years. In this case a genetic mutation does appear to be involved.

DOMSCH (K. H.). **Zur Substratabhängigkeit von Botrytis-Infektionen.** [On the dependence of *Botrytis* infections on the substrate.]—*Z. PflKrankh.*, 64, 3, pp. 129–130, 1957. [English summary.]

In inoculation experiments with *Botrytis cinerea* on *Cyclamen persicum* at the Kiel-Kitzeberg (Schleswig-Holstein) branch of the German Biological Institute, 95 to 100 per cent. positive results were obtained with fresh (one- to two-day-old) inoculum compared with only 20 per cent. at eight days. The decline in virulence is tentatively attributed to the gradual accumulation in the substratum (sterilized leaf disks of the host in these tests) of a substance which adversely affects the metabolism of the fungus and prevents its utilization of the dwindling food reserves [cf. 33, p. 461; 34, p. 472].

LAWRENCE (C. H.). **Infection by Streptomyces scabies on detached Potato tubers.** —*Canad. J. Microbiol.*, 2, 7, pp. 757–758, 1956.

At the Plant Pathology Laboratory, Fredericton, New Brunswick, small Green Mountain potato tubers detached from potted plants or from the axils of cuttings [30, p. 189] were washed and inoculated immediately with *Streptomyces* [*Actinomyces*] *scabies* by rubbing on a sporulating culture or dipping in a spore and

mycelium suspension. After a week's incubation at 28° C. in sterile, moist vermiculite in Petri dishes eruptive scab lesions appeared on the smaller tubers; on the larger ones lesions took longer to develop and were fewer. This technique may be useful in the investigation of the host–parasite relationship and for rapid testing of the pathogenicity of scab isolates.

Gregory (K. F.). **Hyphal anastomosis and cytological aspects of Streptomyces scabies.**—*Canad. J. Microbiol.*, 2, 7, pp. 649–655, 3 pl., 1956.

At the Department of Botany, Ontario Agricultural College, Guelph, hyphal anastomoses were demonstrated in two strains of *Streptomyces* [*Actinomyces*] *scabies* from potato [35, p. 922] and in *Streptomyces* sp. strain T12. Multiple short hyphal bridges developed between neighbouring hyphae without demonstrable cell walls at the points of contact. Two types of swollen bodies were observed [cf. 35, p. 223], one being identified as the residue of the parent spore and the other, always terminal, developing concurrently with or subsequent to secondary mycelium [24, p. 513]. In *A. scabies* aerial hyphae arose directly from the primary mycelium while in *Streptomyces* T12 hyphae with characters intermediate between primary and secondary types were noted.

These observations are discussed in the light of other contributions to the subject and it is concluded that the development of secondary mycelium in the streptomycetes studied results from physiological changes rather than an alternation of haploid and diploid phases.

Tomiyama (K.). **Cytological studies on resistance of Potato plants to Phytophthora infestans. III. The time required for the browning of midrib cell of Potato plants infected by P. infestans.**—*Ann. phytopath. Soc. Japan*, 20, 4, pp. 165–169, 2 graphs, 1956. [Japanese, with English summary.]

In a further study in this series [cf. 35, p. 842] midrib tissue was stripped by razor from the leaves of the resistant potato variety 41089–8 and the susceptible variety Hokkai No. 9 at intervals after inoculation with *Phytophthora infestans*. Penetration occurs 1⅔ to two hours after inoculation in both varieties. In 41089–8 granules in Brownian movement appear around the infection courts within ten mins. to one hour of penetration, and after an equal period the cell contents begin to discolour. Ten to 30 mins. later the movement stops and the cell contents appear to gelatinize. In the susceptible variety, however, Brownian movement does not begin until two to eight hours after penetration and discoloration not until seven to ten hours later, movement ceasing in one to 1½ hours. Degeneration occurs most quickly at the base of the midrib of young leaflets, less so in older leaflets. Some ten hours after gelatinization the cell colour darkens to blackish brown, suggesting that the deposition of polyphenol and other compounds continues after the collapse of the cell.

Grainger (J.). **The 'Auchincruive' Potato blight forecast recorder.**—*Weather*, 10, 7, pp. 213–222, 2 pl., 2 figs., 4 graphs, 1955. [Received April, 1957.]

This is an expanded account, in popular terms, of the construction and performance of a modified thermo-hygrographic instrument suitable for use in forecasting outbreaks of potato blight (*Phytophthora infestans*) [cf. 36, p. 420]. It has already been described from another source [32, p. 501].

Cardenas (M.). **Estudio de los grupos taxonómicos de las Papas silvestres.** [Study of the taxonomic groups of wild Potatoes.]—*Turrialba*, 6, 3, pp. 59–66, 1956. [English summary.]

Among the characteristics investigated in this taxonomic study of 47 wild species of *Solanum* in Bolivia were their resistance to diseases, especially blight (*Phytophthora infestans*) [24, p. 286] and viruses X and Y, which present the most

acute phytotechnical problems in relation to the breeding programme. *Solanum candolleanum* and *S. cevallos-tovari* in the Tuberosa series have a measure of resistance to blight. Two important species belong to the series Circaeifolia, namely *S. circaeifolium* and *S. capsicibaccatum*. No material of the former is available at the experiment stations, but it has been observed growing in a completely healthy state in excessively humid and cold regions where cultivated varieties were already blighted. *S. capsicibaccatum* is stated to have proved resistant to three physiologic races of *P. infestans* in tests carried out in England. The diploidy of these species complicates crossing with the tetraploid cultivated *S. tuberosum* and *S. andigenum*, but the number of chromosomes may be doubled by routine techniques.

S. caipipendense and *S. arnezii*, members of the series Commersoniana, also offer interesting possibilities. Under field conditions the former displays no symptoms of fungus or virus infection, while the latter has remained immune in an area full of virus-diseased plants.

Reference is made to 18 contributions to the literature on breeding for resistance to the foregoing and other potato diseases.

Botting (G. W.). **Potato blights.**—*J. Dep. Agric. S. Aust.*, 60, 7, pp. 299–303, 312, 7 figs., 1957.

Some losses from blight (*Phytophthora infestans*) occurred towards the end of the growing season, 1956, in potatoes in the Adelaide Hills, South Australia, and later also on the Adelaide Plains. This is only the third time since 1900 that any extensive blight losses have been reported in the State.

Early blight (*Alternaria solani*) [see next abstract] is common every year on potatoes and tomatoes. Trials are needed to determine whether it is practicable to control the disease by spraying: difficulty in lifting the crop from wet soil late in the season would probably offset any advantage from delayed harvesting following prolongation of growth by spraying. Secondary bacterial and fungal wet rot [unspecified] often occurs in the field and store and is common after waterlogging. Experience has been that when it occurs harvest is best put off until the ground has dried again. The variety Kennebec and also new potatoes damaged by lifting in hot weather and becoming overheated in bags are susceptible to tuber rot.

Chambers (S. C.). **Potato target spot.**—*J. Dep. Agric. Vict.*, 55, 2, pp. 110–111, 113–114, 3 figs., 1957.

At the Potato Research Station, Healesville, Victoria, potato early blight (*Alternaria solani*) [34, p. 610 and preceding abstract] was effectively controlled by fortnightly applications of maneb (2 lb. per 100 gals. per 100 acres). In three seasons (1953 to 1956), disease incidence was reduced from 1·4, 1·25, and 2 (for the unsprayed) on a scale of 0 (no visible symptoms on individual leaves) to 6 (complete collapse of the leaf) to 0·71, 0·53, and 1·3, respectively; yields were increased from 5·53, 15·21, and 7·99 to 6·74, 18·06, and 9·72 tons per acre, respectively. In 1955–6 applications of maneb at weekly intervals, starting 29th February and ending 11th April, reduced incidence from 2 to 0·92 and increased yields from 7·99 to 10·59 tons per acre.

Maneb at the above rate of application at intervals not exceeding 14 days, starting at the first trace of the disease and continuing for another four to six weeks, was superior to zineb, Bordeaux mixture, and copper oxychloride.

Ramson (A.). **Untersuchungen über die Höhe der durch Kartoffelvirosen verursachten Ertragsverluste bei Sekundärinfektion.** [Investigations on the level of yield losses caused by potato viroses through secondary infection.]—*NachrBl. dtsch. PflSchDienst, Berl.*, N.F., 10, 7, pp. 147–151, 1 fig., 1 map, 1956.

From studies of material at the Central Biological Institute, Berlin, from ten

separate localities in Eastern Germany the author reports that potato losses from [potato] leaf roll virus infection varied from 30·3 to 60 per cent. according to variety, and from potato virus Y from 58·5 to 83·3. With potato virus X losses in Ackersegen averaged 47·9 per cent., and in Aquila between 19·9 and 21·5. With mixed infections losses ranged from 59·5 to 85·2 per cent., according to variety.

Seko (H.), Samoto (K.), & Sugimoto (K.). **Effects of foliage sprays of urea on Rice plants in 'akiochi' or 'saline injured' paddy fields.**—*Bull. Div. Pl. Breed., Tôkai-Kinki agric. exp. Sta.* 3, pp. 56–72, 1956. [Japanese, with English summary.]

In further experiments from 1951 to 1954 on rice affected by akiochi [cf. 35, p. 714] and saline injury in Japan beneficial results were obtained by spraying with 2 per cent. urea. Application two to three weeks before heading increased the number of grains in the panicle, and at ten days to a fortnight after heading increased the fertility of the seed.

Hashioka (Y.) & Makino (M.). **Relation of nitrogen nutrition of Rice plants to the susceptibility to four foliage diseases.**—*Res. Bull. Fac. Agric. Gifu Univ.* 6, pp. 58–66, 1956. [Japanese summary.]

At Gifu University, Japan, *Cochliobolus* [*Ophiobolus*] *miyabeanus* [36, p. 208], *Rhynchosporium oryzae* [34, p. 482], *Cercospora oryzae* [map 71], and *Acrocylindrium oryzae* (sheath rot) in culture and on rice plants were subjected to different nitrogen treatments. *O. miyabeanus* grew more vigorously *in vitro* with increasing nitrogen (up to 0·2 per cent. potassium nitrate) until the pH of the medium reached an adverse level. On inoculated plants growing in sand cultures, however, the number and size of lesions decreased with increasing nitrogen (up to 12 mg. ammonium sulphate per l. water). *R. oryzae* grew poorly on synthetic media but vigorously on potato agar and special media with vitamin B_1; on the plant infection increased with increasing nitrogen, as it did with the other fungi investigated, though with *C. oryzae* the highest level of nitrogen depressed the amount of infection.

Hashioka (Y.) & Ikegami (H.). **Phytopharmacological studies on the Rice diseases. III. Fungitoxicity of the different dust fungicides evaluated by protoplasm coagulation in conidia of Cochliobolus miyabeanus.**

Hashioka (Y.) & Takamura (Y.). **Phytopharmacological studies on the Rice diseases. IV. Protoplasmic alteration of conidia of Cochliobolus miyabeanus in the organomercurial solutions.**—*Res. Bull. Fac. Agric. Gifu Univ.* 7, pp. 41–48, 1 pl., 8 graphs; pp. 49–54, 3 graphs, 1956. [Japanese summaries.]

Further studies in this series [cf. 35, p. 713] showed that the toxicity of a number of fungicidal dusts to *Cochliobolus* [*Ophiobolus*] *miyabeanus* could be assayed by observing their effect on the conidia. The reactions induced were graded in six categories, including normal spore germination, reduced germination, absence of germination accompanied by vacuolation, partial coagulation, and finally complete coagulation of the cell contents. Judged in this manner, a dust composed of 0·4 per cent. phenyl mercuric acetate plus slaked lime [called 'ceresan-lime': loc. cit.] was the most active of the fungicides tested.

The second paper deals with the plasmolysis of conidia by organomercurial fungicides. The osmotic pressure of conidia of *O. miyabeanus* in culture appeared to be the same as the values found by Naito for fungi in rice grains [33, p. 559]. In trials with six mercurials and copper sulphate spores of *O. miyabeanus* germinated at dilutions greater than 5×10^{-7} gm. mercury or copper per l., but stronger solutions always caused coagulation of the protoplasm, the degree depending on the chemical structure of the fungicide rather than on its concentration. For instance, at 5×10^{-4} to 5×10^{-5} mercury, 'ceresan' caused more coagulation than its active ingredient

(phenyl mercuric acetate). It is suggested that the fungicidal action may be due to inactivation of the SH system of the enzymes present. There seem also to be differences in the degree of absorption and accumulation of the different toxic substances by the spores.

Valdez (R. B.). **Sheath spot of Rice.**—*Philipp. Agric.*, 39, 6, pp. 317–336, 4 figs., 1955. [Received January, 1957.]

This paper describes in some detail studies at the Central Experiment Station in 1954 on the distribution, symptoms, morphology, physiology, pathogenicity, host-range, life-history, and methods of control of sheath spot of rice in the Philippines, which the author attributes to *Rhizoctonia* [*Corticium*] *solani* [6, p. 252; cf. 17, p. 622].

Sclerotia were not produced in cultures in the sun, in a desiccator, or with 3-hour periods of alternating light and dark, though they were abundant after three or four days on most media at pH 4 to 8·5 in the laboratory. The mycelium remained viable for more than a month in pieces of leaf sheath in soil, and sclerotia for nine months in the laboratory and for six months in the field.

The fungus was found to be capable of infecting rice plants at any age, all stages being equally susceptible, but damage on young plants is more severe. Of 14 upland rice varieties tested by inoculation at the boot stage only Inintiw and Macapilay Pusa proved fairly resistant. The fungus attacked 12 grasses commonly found as weeds in rice fields, sugar-cane, on which it produced typical banded sclerotial disease, and string beans (*Vigna sesquipedalis*), which developed damping off, collar rot, and severe blight.

The control measures suggested include destruction of stubble and weed grasses, use of non-infected irrigation water, and avoidance of thick planting.

Nonaka (F.) & Yoshii (H.). **Observations of the conidia of Rice stem-rot fungus (Helminthosporium sigmoideum Cav.). I. Dissemination of conidia in fields and their sporulation from sclerotia.**—*Sci. Bull. Fac. Agric. Kyushu*, 15, 4, pp. 435–440, 1 pl., 1 diag., 1956. [Japanese, with English summary.]

Conidial dispersal of the rice stem rot fungus (*Helminthosporium sigmoideum*) [*Leptosphaeria salvinii*: cf. 26, p. 415; 35, p. 843, and next abstract] occurred from the end of August to the end of October, with a maximum at the end of September. Many conidia were trapped on glass slides 10 cm. above the ground in the field, but very few at 30 cm. When sclerotia were placed in a saturated atmosphere at 22° to 25° C. conidiophores appeared after 48 hours and spore formation began nine hours or so later, taking about ten hours for completion.

Nonaka (F.). **On the severity of Rice stem-rot when the plants were treated with the leaf excision combined with varied quantities of sclerotial inocula of the causal fungus Helminthosporium sigmoideum.**—*Sci. Bull. Fac. Agric. Kyushu*, 15, 4, pp. 431–434, 1 graph, 1956. [Japanese, with English summary.]

Both leaf removal and increase of sclerotial inoculum increased the severity of *Helminthosporium sigmoideum* [*Leptosphaeria salvinii*: see preceding abstract] on rice, but the former was more effective.

Yamada (W.) & Yamoto (H.). **Studies on the stripe disease of the Rice plant. III. Host plants, incubation period in the Rice plant and retention and overwintering of the virus in the insect, Delphacodes striatella Falén.**—*Spec. Bull. Okayama Prefect. agric. Exp. Sta.* 55, pp. 35–56, 2 diags., 3 graphs, 1956. [Japanese, with English summary.]

In this further study on the rice stripe virus [cf. 35, p. 924] transmission by *Delphacodes striatella* to a large number of species of grasses belonging to 23 genera

showed *Leersia oryzoides* var. *japonica*, *Bromus catharticus*, *Glyceria acutiflora*, *Trisetum bifidum*, *Briza minor*, *Cynodon dactylon*, Sudan grass, and *Sorghum halepense* to be among its potential alternative hosts. The vector remained viruliferous through 24 generations. The incubation period in rice was not affected by the age of the plant and decreased with increasing temperature. It is believed that initial infection in seed beds in June is chiefly by infected vectors that have overwintered, with their offspring, on rice, rather than by those that have acquired the virus from wild hosts in the spring.

Decaying timber spreads root disease.—*R.R.I. Plant Bull.* 29, pp. 31–35, 6 figs., 1957.

An account is given in semi-popular terms of the spread of infection by *Fomes noxius*, *F. lignosus*, and *Ganoderma pseudoferreum* in *Hevea* rubber in Malaya [cf. 12, p. 52; 34, pp. 396, 545, *et passim*], spores of all three species colonizing the stumps, and the rhizomorphs of *F. lignosus* timber left about after felling.

Merny (G.). **Helminthosporium heveae Petch dans les pépinières d'Hévéa de la Côte d'Ivoire.** [*Helminthosporium heveae* Petch in *Hevea* nurseries in the Ivory Coast.]—*Rev. Path. vég.*, 35, 4, pp. 233–239, 1 fig., 2 graphs, 1956.

With the large-scale planting of *Hevea* rubber in the Ivory Coast, *Helminthosporium heveae* [33, p. 758], formerly found only on trees bordering roads and causing no appreciable damage, has now become widely prevalent. It appeared simultaneously in nurseries at La Mé and near Bingerville, both containing clones introduced from Indo-China, which displayed widely different degrees of susceptibility. On the whole, the non-grafted hybrids at Bingerville were more severely infected than the grafted clones at La Mé. Clones Av 50 and Av 427 were highly susceptible; they should not be cultivated unless effective means of control are available.

Magnitsky (K. P.). Марганцевое голодание растений. [Manganese deficiency of plants.]—Наука перед. Опыт сел. Хоз. [*Sci. advanced Exp. Agric.*], *1957*, 1, pp. 45–47, 2 figs., 1957.

Manganese deficiency, occurring in the southern regions of the U.S.S.R., was studied in 1955 by the Scientific Institute for Manures and Insecto-Fungicides in a number of crops, including vegetables, cereals, and fruit, growing on peat and sandy soils in the vicinity of Moscow. Symptoms characteristic of the disorder are briefly described for each crop and the conventional control methods indicated.

Buchner (A.). **Zur Heilung der Kalkchlorose (Gelbsucht) im Obstbau.** [On the cure of lime-induced chlorosis (yellows) in fruit-growing.]—*Gesunde Pfl.*, 8, pp. 133–134, 1956. [Abs. in *Z. PflKrankh.*, 64, 3, pp. 143–144, 1957.]

Lime-induced chlorosis is reported to have been widespread among fruit trees, vines, and ornamental shrubs in south-west Germany [cf. 29, p. 287] during 1955. A rapid improvement was effected by treatment with an organic iron compound, 'BASF-chlorosemittel' [chlorosis remedy], which may be sprayed on the foliage, incorporated in the soil, or broadcast. Two to three applications at six- to ten-day intervals in May or June generally sufficed for the renewal of a normal green coloration.

Picci (G.) & Verona (P.). **Qualche ricerca biologica sui terreni dello Stato di S. Paolo del Brasile.** [Some biological researches on the soils of the State of São Paulo, Brazil.]—*Boll. Ist. sieroter. Milano*, 35, 3–4, pp. 157–179, 5 figs., 1 graph, 1956. [English summary.]

In this account the authors briefly describe the six main types of soil present in São Paulo, Brazil, indicate the numbers of bacteria, actinomycetes, and fungi in samples of each type, and give notes on the different physiological groups of

organisms and on the species of fungi isolated. The soils examined were rather poor in micro-organisms, probably because of high temperatures and lack of moisture. Of the few pathogenic species obtained, *Fusarium equiseti* and *F. oxysporum* were frequent, while *F. concolor* and *Verticillium malthousei* were isolated once (from cultivated areas).

Picci (G.). **Intorno all'azione dello zineb, dell'SR-406 e del karatano su di alcuni funghi isolati dal terreno.** [On the action of zineb, SR-406, and karathane on certain fungi isolated from soil.]—*Ann. Fac. Agr., Pisa*, N.S., 16, pp. 145–148, 1955. [French summary. Received 1957.]

In *in vitro* experiments at the Institute of Plant Pathology and Agricultural and Technical Microbiology, Pisa, SR-406 at 0·06 per cent. had a strongly inhibitory effect on the growth (dry weight) of soil fungi [see preceding and next abstract] in bean-sucrose agar; zineb was less active and karathane still less.

Picci (G.). **Azione dell'SR-406 (N-trichlorometiltiotetraidroftalimide) sui micro-organismi del terreno.** [The action of SR-406 (N-trichloromethylthio tetrahydrophthalimide) on soil micro-organisms.]—*Agricoltura ital.*, 56 (N.S. 11), pp. 376–382, 1956.

In further experiments at the University of Pisa, Italy [see preceding abstracts], SR-406 had no effect on soil micro-organisms (bacteria, yeasts, and fungi imperfecti) when incorporated in soil inoculated with the species.

Verona (O.), Picci (G.), & Gambogi (P.). **Comportamento di alcuni funghi terricoli di fronte agli insetticidi sistemici (O.M.P.A.).** [The behaviour of some soil fungi in the presence of systemic insecticides (O.M.P.A.).]—*Ann. Fac. Agr., Pisa*, N.S., 16, pp. 75–79, 1 graph, 1955. [French summary. Received 1957.]

In experiments at the Institute of Plant Pathology and Agricultural Microbiology, University of Pisa, all the 14 species of soil fungi tested [see preceding abstracts] grew in media in which the only source of phosphorus was the insecticide O.M.P.A. (octamethylpyrophoramide).

Annual Report of the Department of Hop Research, Wye College, 1955.—155 pp., 1 pl., 10 graphs, 1956.

In a review of the research programme (pp. 6–14) H. S. Darling outlines work done on breeding for resistance to wilt (*Verticillium albo-atrum*) [36, p. 126] and on the control of downy mildew (*Pseudoperonospora humuli*) [35, p. 469], two of the problems under special investigation. An account is given (pp. 16–18) of steps taken to isolate and eradicate an outbreak of wilt which began in one field at the college in 1954 and was spreading during 1955.

In a review by H. S. Darling and Dorothy M. Derbyshire of the work of the Plant Pathology Section (pp. 43–51) spraying trials in 1954 and 1955 to control downy mildew are described. Captan (four applications at 2½ lb. wettable powder, with 50 per cent. active ingredient in 100 gals. water) gave as good control of the disease on the leaves and shoots of Golding hops as Bordeaux mixture (10–15–100) or copper oxychloride (3 lb. to 100 gals.), and increased yield and quality at harvest. As low incidence of the disease prevented assessment of control on the cones the trial was to be repeated.

Holliday (P.) & Mowat (W. P.). **A root disease of Piper nigrum L. in Sarawak caused by a species of Phytophthora.**—*Nature, Lond.*, 179, 4558, pp. 543–544, 1957.

In a note from the Pepper Laboratory, Department of Agriculture, Sarawak, the authors report that a species of *Phytophthora* was isolated, after surface sterilization, from the cortical region of main roots and stems of dying pepper vines [33, p. 630].

Below ground level there was an abrupt transition between healthy and necrotic tissue. Inoculation with pieces of rice agar culture on nine-month-old cuttings growing in soil partially sterilized by heat and on $2\frac{1}{2}$-year-old vines in the field caused them to become moribund, the former in 11 days and the latter in 15 to 50 days. Roots and wounded stems of the older vines were susceptible to inoculation in this way, but unwounded stems developed, at most, slight infection. The fungus was reisolated from inoculated plants.

Infection is widespread in the first division, south of Kuching. Observation suggests that infection originates in the fine roots, the resultant cortical necrosis spreading from the main roots to the underground stems, after which symptoms are seen above ground. These include checking of terminal shoot growth, rapid yellowing of leaves, and fall of leaves and small shoots. They are fairly uniform over the entire vine and may appear rapidly; in a stand of 1,044 vines covering 1·4 acres, of which 8·1 per cent. were dying in December 1955, 80·4 per cent. were dying four months later.

It is proposed that the disease, previously called 'sudden death', be termed foot rot.

Annual Report of the Research Department, Sugar Manufacturers' Association of Jamaica, 1955.—76 pp., 7 graphs, 1956. [Received February, 1957.]

In the section of this report [cf. 36, p. 350] dealing with sugar-cane diseases in Jamaica (pp. 22–24) it is stated that heavy infection by eyespot (*Helminthosporium sacchari*) may necessitate the withdrawal of the variety Co. 421 from the Trelawny area. Sugar-cane mosaic virus [35, p. 845] is being controlled by the use of resistant varieties, though it is still prevalent in B 37161 and remnants of B 34104.

Chlorotic streak virus is now widespread on B 37172 in the area where the disease was first reported in 1949, and is also common on the highly susceptible B 4362. Breeding for resistance to mosaic virus has apparently been inadvertently accompanied by increased susceptibility to chlorotic streak. Observations on B 4362 at Jamaica Sugar Estates (high rainfall) and Worthy Park (higher elevation) showed that this disease can delay germination markedly, and that heat treatment, very effective in controlling leaf symptoms, does not affect the germination rate of diseased setts but improves that of healthy setts. In wet areas, however, secondary infection was such that, after starting with clean plant cane, the first ratoon stubble showed 50 per cent. infection. Juice quality was not affected, but yields could be seriously reduced. At Worthy Park the yield was 26 per cent. more from healthy than from infected plant canes which subsequently developed 19 per cent. streaked stools in the first ratoon stubble. At Jamaica Sugar Estates the yield of cane stools, initially 1 per cent. streaked with 50 per cent. in first ratoon stubble, was 56 per cent. more than that of cane 33 (later 99) per cent. streaked.

Experiments on Co. 421 at Long Pond confirmed the presence of ratoon stunting virus and demonstrated the effectiveness of hot water treatment (50° C. for two hours); loss in yield due to the disease was 12 per cent., comparable to that of Pindar and P.O.J. 2878 in Queensland [36, p. 352]. At six months diseased cane may be smaller than comparable healthy cane, yet have no internal symptoms (a feature also observed in Queensland).

In a detailed account (pp. 21–22) of the procedure employed in germinating 'fuzz' (seed) to avoid damping off by *Pythium* sp. and *H. sacchari* the use of an aretan spray at sowing and a phygon solution during subsequent watering (both 0·1 per cent. w/v) are described.

Rafay (S. A.) & Singh (V. B.). **A new strain of Glomerella tucumanensis.**—*Curr. Sci.*, **26**, 1, pp. 19–20, 1957.

During the 1955–6 season a new strain of *Glomerella tucumanensis* was isolated

at the Mycology Section, Indian Institute of Sugarcane Research, Lucknow, from a collection of B.O. 11 cane from Ram Kola, District Deoria, Uttar Pradesh. A similar strain was isolated from B.O. 11 at the Central Sugarcane Research Station, Pusa, Bihar, in 1952–3. The new strain, designated I, sporulates profusely and is even more virulent than strain D on all the sugar-cane varieties tested except Co. 453 [cf. 30, p. 629].

Goos (R. D.). **Classification of the fungi imperfecti.**—*Proc. Iowa Acad. Sci.*, 63, pp. 311–320, 1956.

Following a critical comparison of the classifications of Saccardo, Vuillemin, Mason, Hughes, Langeron and Vanbreuseghem, and Moreau, and discussing spore types, the author concludes that the only sound criteria for separating the fungi imperfecti are the precise spore type and its mode of development.

Abe (S.). **Studies on the classification of the Penicillia (continued).**—*J. gen. appl. Microbiol.*, 2, 3, pp. 195–344, 23 pl. (6 col.), 1956.

The second part of this monograph on the genus *Penicillium* [cf. 36, p. 214] consists of tables setting out the colony, microscopic, and biochemical characters of the species dealt with in part I. The illustrations comprise coloured photographs, electron micrographs of conidia, and photomicrographs.

British Commonwealth collections of micro-organisms. Directory of collections and list of species maintained in Canada.—vi+45 pp., London, H.M. Stationery Office, 1956. 6*s.* 6*d.*

This directory [cf. 31, p. 291; 34, p. 386] lists the institutions in Canada maintaining collections of micro-organisms. The species held are listed with code numbers of the appropriate collections, a key to which appears at the end of the publication.

Brown (A. M.). **A check list of plant rusts in Canada.**—*Publ. Dep. Agric. Can.* 976, v+51 pp., 1956.

This check list of rusts, from records published up to 1952, is arranged in alphabetical order, the epithets in general following Arthur [13, p. 728]. There is in addition a host list, with the rusts to be expected on each species.

Morimoto (Y.). **Notes on the rust fungi collected from Amami-Ohshima.**—*J. Jap. Bot.*, 31, 2, pp. 37–41, 1956.

The writer lists 48 species of rusts collected from Amami-Ohshima, Ryukyu Islands [cf. 35, p. 125]. Four new species are described.

Hiratsuka (N.) & Sato (S.). **Inoculation experiments with heteroecious species of the Japanese rust fungi (5).**—*J. Jap. Bot.*, 31, 1, pp. 29–32, 1956.

The continuation of this series [cf. 32, p. 452] deals with two species of *Melampsoridium*, one of *Uromyces*, and two of *Puccinia*.

Saksena (H. K.). **Two new records of Uromyces sp. from India.**—*Sci. & Cult.*, 22, 6, pp. 337–338, 1956.

During the systematic study of collections of *Uromyces* spp. on leguminous plants at the Cryptogamic Herbarium, New Delhi, two species new to India were discovered, *U. pisi* on *Lathyrus sativa* and *L.* sp., and *U. rugulosus* on *Lespedeza eriocarpa*.

Viennot-Bourgin (G.). **Notes mycologiques (Série VI). Trois espèces parasites, nouvelles pour la France, sur plantes d'ornement.** [Mycological notes (Series

VI). Three parasitic species, new to France, on ornamental plants.]—*Rev. Mycol., Paris*, 21, 2–3, pp. 132–145, 7 figs., 1956.

In this contribution to the present series [34, p. 821], descriptive notes are given on *Helminthosporium cactivorum* [35, p. 191], found on *Cereus* sp. at Saint-Jean Cap-Ferrat (Alpes-Maritimes), *Ascochyta cocoes-capitatae* on potted plants of *Phoenix canariensis* growing in a glasshouse near Paris, and *Ustilago raciborskiana* on flowers of *Polygonum baldschuanicum* [36, p. 189] growing near Meux (Charente-Maritime).

Gordon (W. L.). **The taxonomy and habitats of the Fusarium species of Trinidad, B.W.I.**—*Canad. J. Bot.*, 34, 6, pp. 847–864, 12 figs., 1956.

This study, begun in 1955 at the Imperial College of Tropical Agriculture, Trinidad, was completed at the Laboratory of Plant Pathology, Winnipeg, Manitoba. The following were found for the first time in Trinidad: *Nectria ecoccophila* [23, p. 410] and *F. larvarum*, both on scale insects on citrus (the former previously reported under *Sphaerostilbe coccophila* and *S. flammea*), *F. equiseti*, from soil, *F. stilboides* causing decay of immature coffee berries, *Hypomyces solani* from several crops, and the conidial state of *Calonectria rigidiuscula* on dead branches of cacao and perennial cotton. *F. semitectum* on seeds and fruits of a number of crop plants and *Gibberella fujikuroi* on many hosts in its conidial state were the most commonly encountered, varieties of the latter, namely, *anthophilum* from a ripe coconut husk and *subglutinans* from grapefruit twig die-back, sugar-cane, etc., also being found. In addition *F. coccidicola* was present on scale insects on citrus and mango, *F. lateritium* on die-back twigs of grapefruit and on scale insects on citrus, and *F. oxysporum* on a number of hosts. *F. album*, listed by Baker and Dale [30, p. 489], is regarded as *Cylindrocarpon album*. The species are also listed under their habitats.

Loubière (A.). **Considérations sur la morphologie et sur les affinités d'un Blastosporé.** [Considerations on the morphology and affinities of a blastosporous fungus.]—*Bull. mens. Soc. linn., Lyon*, 25, 4, pp. 109–111, 1956.

An account is given of the morphological characters in culture of and blastospore formation in *Alternaria tenuis*, the paper concluding with a brief discussion of relationships.

Ellis (J. J.). **A note on Epicoccum.**—*Proc. Iowa Acad. Sci.*, 63, pp. 307–310, 4 figs., 1956.

A species of *Epicoccum* isolated from a maize stalk near Iowa City in September, 1956, was determined as *E. nigrum* (syn. *E. neglectum*). A detailed description of conidial development is followed by the observation that descriptions of at least six other species of the genus could also refer to *E. nigrum*.

Heim (Panca). **Remarques sur le cycle évolutif du Synchytrium endobioticum.** [Observations on the life-cycle of *Synchytrium endobioticum*.]—*C. R. Acad. Sci., Paris*, 42, 23, pp. 2759–2761, 1956.

A brief account is given of work carried out at the Laboratory of Plant Biology, Sorbonne, Paris, on the cytology of the phases in the development cycle of *Synchytrium endobioticum* [1, p. 80; 35, p. 630, and next abstract].

Heim (Panca). **Remarques sur le développement, les divisions nucléaires et le cycle évolutif du Synchytrium endobioticum (Schilb.) Perc.** [Notes on the development, nuclear divisions, and life-cycle of *Synchytrium endobioticum* (Schilb.) Perc.]—*Rev. Mycol., Paris*, 21, 2–3, pp. 93–120, 2 pl., 1956.

Studies at the Laboratory of Plant Biology, the Sorbonne, University of Paris, showed that the resting sporangia of *Synchytrium endobioticum* [see preceding abstract] are purely vegetative organs and not the result of a sexual process. All

phases of ordinary nuclear division occur within the greatly enlarged nucleus, near the nucleolus, which is also hypertrophied. Repeated divisions occur, the nuclei increasing in numbers until eventually they show more and more a distinct tendency to group in pairs and fuse. This phase marks the end of the vegetative stage.

The thallus now changes directly into a sporangium, within which the nuclei, fusing after a short resting period, simultaneously divide twice in succession, giving rise to the nuclei of future spores.

In every division in the thallus there are six chromosomes. After two divisions in the sporangium uninucleate spore initials are formed. These spores move by means of pseudopodia, and in this form they penetrate the host cell and develop into protoplasmic masses.

The summer sporangia or sori derive from protoplasts which have developed individually in the same cell. The wall of the infected cell, thickened and yellow, forms the protective wall of the sorus. In unfavourable conditions a single protoplast may become encysted (at the expense of the others) and pass winter dormancy in the invaded cell. A bibliography of 87 titles is appended.

Ibrahimov (G. R.). Специализация видов **Colletotrichum** на некоторых бобовых, тыквенных и пасленовых растениях. [Specialization of species of *Colletotrichum* on certain leguminous, cucurbitaceous, and solanaceous plants.]—*Trud. vsesoyuz. Inst. Zashch. Rast.* 3, pp. 205–212, 1951. [Received 1956.]

Of the species of *Colletotrichum* on leguminous, cucurbitaceous, and solanaceous plants in the U.S.S.R., some, such as *C. atramentarium*, were found to be pathogenic to a wide range of hosts, even from different families, whereas *C. trifolii* and *C. lycopersici* were each restricted to two or three genera from a single family. The intensity of development of these fungi, the number of plant species affected, and the damage caused were all directly influenced by the length of time the inoculated plants were kept under humid conditions.

The fact that anthracnose fungi can infect wild hosts suggests that they are maintained and multiply in nature on weeds, for instance *C. atramentarium* on *Datura stramonium* and *C. trifolii* on *Melilotus officinalis*. The occurrence of different geographical races among the anthracnose fungi is indicated.

Duddington (C. L.). **The predacious fungi: Zoopagales and Moniliales.**—*Biol. Rev.*, **31**, pp. 152–193, 3 figs., 1956.

This comprehensive review of the predacious fungi deals with their morphology, reproduction, taxonomy, general biology, and possible economic significance. It concludes with a list of 206 references.

Paul (H. L.). **Spektralphotometrische Untersuchungen über die Virusvermehrung in Tabak.** [Spectrophotometric studies on virus multiplication in Tobacco.]—*Phytopath. Z.*, **28**, 3, pp. 307–318, 8 graphs, 1957.

At the Institute for Agricultural Virus Research, Brunswick, using a modification of the ultra-violet spectrophotometric method of Lindner *et al.* [31, p. 420], the author compared the nucleic acid contents of healthy and virus-diseased Samson tobacco leaves of various ages. A study of the multiplication curves of tobacco mosaic virus revealed a steep initial increase in nucleic acid values followed by a decline about a fortnight after inoculation, and in some of the tests by cessation after about 20 days [cf. 21, p. 352; 36, p. 134, *et passim*]. In the case of potato virus X the curve for nucleic acid values rose less steeply and fell after eight to ten days. A further slight decrease after three weeks [cf. 35, p. 551] is difficult to interpret. No inferences regarding virus multiplication could be drawn from the very low and strongly fluctuating nucleic acid values obtained in the tests with the potato Y and bouquet viruses.

Klinkowski (M.) & Schmelzer (K.). **Beiträge zur Kenntnis des Virus der Tabak-Rippenbräune.** [Contributions to the knowledge of the Tobacco vein-browning virus.]—*Phytopath. Z.*, 28, 3, pp. 285–306, 11 figs., 1 graph, 1957.

A virosis of tobacco inducing a brown discoloration of the leaf veins was first observed at the Institute for Tobacco Research, then situated in the Köthen district, and has since been observed in many localities of central Germany. Other symptoms include necrosis of the veins, petioles, and stems, faint mottling, and foliar epinasty, with little tendency to recovery. The virus responsible for the disease was identified as a variant, 'M3', of potato virus Y, for which the name of *Marmor upsilon* var. *costaenecans* is proposed. It was pathogenic in inoculation experiments to *Nicotiana glutinosa*, tomato, *Datura metel*, and *Petunia hybrida*, the last-named reacting exclusively by necroses and local lesions.

Transmission was effected by means of *Myzus persicae*, but tests with a number of *Cuscuta* spp. gave negative results [36, p. 173]. The new virus was able to attack plants already infected by typical potato virus Y or tobacco etch virus. The variant reacted positively with anti-Y- and negatively with anti-X-virus serum. Its thermal death point was 62° C. and its dilution end point above 1 in 50,000. It resisted ageing *in vitro* and desiccation for upwards of 50 days at 21° to 23°.

Canova (A.). **Ricerche intorno ad una virosi del Pomodoro (mal della striscia). I. Individuazione dell'agente infettivo.** [Studies on a virosis of the Tomato (streak disease). I. Identification of the infective agent.]—*Phytopath. Z.*, 28, 3, pp. 343–352, 5 figs., 1957. [German and English summaries.]

From the results of further studies at the Institute of Plant Pathology, Bologna, on the virosis affecting tomato fruits on the Marche coast of central Italy [34, p. 618], the agent appears to be a strain of tobacco mosaic virus closely related to the group of strains responsible for single streak [26, p. 425 *et passim*]. Thus, inoculated to White Burley tobacco, *Nicotiana glutinosa*, and *Datura stramonium* leaves, it gives rise only to localized necroses, followed in the case of *Petunia* sp. by systemic symptoms. Chilli (*Capsicum annuum*) reacts by generalized infections and foliar mottling. Tests on *Plantago lanceolata*, *P. major*, and bean (*Phaseolus vulgaris*) gave negative results. The virus succumbed to ten minutes' exposure to a temperature of 85° C. It was shown by premunity tests that inoculation with a comparatively mild strain of tobacco mosaic virus protects tomato plants against subsequent infection by the virus under observation.

Gäumann (E.) & Loeffler (W.). **Über die Wirkung von Fusarinsäure auf die Wasserpermeabilität der Markzellen von Tomatenpflanzen.** [On the action of fusarinic acid on the water permeability of pith cells of Tomato plants.]—*Phytopath. Z.*, 28, 3, pp. 319–328, 1 graph, 1957. [English summary.]

The results of determinations at the Federal Technological Institute, Zürich, on the influence of fusarinic acid concentration on the water permeability of pith cells from four- to six-week-old Tuckswood tomato seedlings [34, p. 112] showed that increasing concentrations of the toxin not only enhance the intensity of the disturbance of permeability but change its direction.

The first modifications in permeability become noticeable between 5×10^{-8} and 10^{-7} M. This threshold value is exceeded in cultures of *Fusarium* [*bulbigenum* var.] *lycopersici* on Richards's agar and in wilted plants two days after inoculation. In the first phase (up to 5×10^{-7} M) water permeability increases parallel with a rising fusarinic acid concentration up to 1·5 times its initial value. This process culminates in excessive transpiration [33, p. 122] and damage to the semi-permeability of the plasma membrane, thereby rendering the protoplasts accessible to toxins, enzymes, and other products of the fungus.

In the second phase an increase in fusarinic acid concentration beyond 5×10^{-7} M

causes a fall in water permeability, while above 10^{-5} it is reduced below that of normal cells. Thus, the decreased transpiration of wilted tomato plants at this stage is caused not only by mechanical factors, such as advancing hyphae and pectin plugs, but by the action of the acid in lowering the water permeability of the protoplasts.

Within the diseased plants fusarinic acid gradients are established, a high concentration leading to a decrease in permeability at the proximal end and to an increase in the distal region. Hence the transpiration curves of naturally infected plants are a resultant of very heterogeneous factors.

Menon (R.) & Schachinger (L.). **Die Rolle des Phenols bei der Widerstandsfähigkeit von Tomatenpflanzen gegen Infektionen.** [The role of phenol in the resistance of Tomato plants to infections.]—*Ber. dtsch. bot. Ges.*, 70, 1, pp. 11–20, 1 fig., 4 graphs, 1957.

The present work was undertaken to investigate the possibility that vascular discoloration in wilt disease of tomato (*Fusarium* [*bulbigenum* var.] *lycopersici*) results from the oxidation of free phenols liberated from glycosides, tannins, or lignin by polyphenoloxidase secreted by the parasite [cf. 36, p. 284].

The polyphenoloxidase level in the leaves and buds of the susceptible variety Bonny Best and the resistant Tuckswood was higher in infected than in healthy plants and higher in the resistant than in the susceptible. The total phenol content of the leaves and petioles in the resistant Tuckswood, Pan American, and Red Currant was higher in infected plants than in controls, while in Bonny Best it was much the same. The polyphenoloxidase level varied with the total phenol content, which was proportional to resistance [cf. 33, p. 123]. It is concluded, therefore, that the phenols cannot be responsible for wilting. Only one phenol was detected by paper chromatography. Further work is envisaged.

Ceponis (M. J.) & Friedman (B. A.). **The occurrence of Phomopsis on Tomatoes in New York.**—*Plant Dis. Reptr*, 39, 12, pp. 989–990, 1955.

A small percentage of mature green tomatoes from New City, New York, developed an extensive, soft, watersoaked decay in ripening studies at the United States Market Pathology Laboratory. Pycnidia of a *Phomopsis* [see below, p. 511] were produced. On inoculation into green and colouring fruits the fungus proved pathogenic.

Gammon (N.) & Sharpe (R. H.). **Mouse ear—a manganese deficiency of Pecans.**—*Proc. Amer. Soc. hort. Sci.*, 68, pp. 195–200, 1 fig., 1956.

Investigations at the University of Florida into 'mouse ear' or 'little leaf' of pecans [5, p. 565; cf. 16, p. 717], a condition characterized by a shortened midrib, which changes the tip of the leaflet from pointed to rounded, the entire leaf, in severe cases, being much smaller than usual, showed that while healthy pecan leaves frequently contained 500 to 2,000 p.p.m. of manganese, 'mouse ear' leaves usually had under 100 p.p.m.

Converse (R. H.). **Field tests of contact fungicides for Pecan scab control.**—*Plant Dis. Reptr*, 40, 11, pp. 961–964, 1956.

Commercial use of contact (eradicant) fungicides for control of pecan scab (*Cladosporium effusum*) [36, p. 363] is limited by toxicant levels on forage plants under sprayed trees and by economic considerations. In field trials at Paden, Oklahoma, in 1955, corona CM-220 (monocalcium meta-arsenite, Corona Chemical Division, Moorestown, New Jersey) at 3 lb. per 100 gals., puratized agricultural spray (5 pints), and dowicide G (4·5 lb. plus dormant oil emulsion 1 gal.) were

applied twice in late March at 50 gals. to each tree and the ground round it, followed by five summer protectant sprays of ziram (2 lb.). All three contact sprays eliminated spore production on over-wintering stromata, and contact and protectant sprays, used consecutively, reduced the average number of scab lesions per nut in August from 88·7 (untreated) to 0·9 or less. Arsenic and mercury were detected in the grass beneath the trees but not in the nuts at harvest.

Thirty-second Annual Report of the Imperial Forestry Institute, 1955–56.—28 pp., University of Oxford, 1956.

In the section of this report [cf. 35, p. 643] dealing with forest pathology (pp. 14–16) further investigation of bark necrosis of Japanese larch [*Larix leptolepis*: 35, p. 129] is noted. From 350 wood samples taken above and between the roots it has been observed that main stem moisture saturation falls from spring to summer, that it is lower on a cankered than on a non-cankered site (the soil of the former also being drier), and generally higher in trees on the periphery of a plantation, where severe bark injury is less evident, than inside. This evidence suggests a water factor as the cause of the trouble.

Rishbeth (J.) & Meredith (D. S.). **Surface microflora of Pine needles.**—*Nature, Lond.*, 179, 4561, pp. 682–683, 1957.

The presence of large numbers of fungal spores on the crowns of pines (*Pinus sylvestris* and *P. nigra* var. *calabrica*) in East Anglia was demonstrated by trickling water through freshly gathered needles on to sections of pine stem about 7 cm. in diameter and 1 cm. thick, and incubating at 22° C. Unsterilized sections favoured the growth of wood-rotting and, to a lesser extent, blue-stain fungi; on sterilized sections the former are suppressed. The approximate spore counts per needle in December, 1956, were: *Fomes annosus*, 1; *Cladosporium* sp., 4; *Peniophora gigantea*, 6; *Sclerophoma pithyophila* [36, p. 290], 14; and *Ophionectria cylindrospora*, 60. Thus, the total spore population of a single crown is very high, measurable possibly in millions. *F. annosus* was detected by this means in several localities in Thetford Chase. Rain-water drops falling from the tree canopy have been shown to contain spores of *F. annosus*, *P. gigantea*, and *Stereum sanguinolentum*, as well as blue-stain and other wood-inhabiting fungi.

Rennerfelt (E.). **Untersuchungen über die Wurzelfäule auf Fichte und Kiefer in Schweden.** [Studies on the root rot of Spruce and Pine in Sweden.]—*Phytopath. Z.*, 28, 3, pp. 259–274, 3 figs., 1 diag., 4 graphs, 1 map, 1957. [English summary.]

Much of the information in this survey of the existing position in respect of spruce and pine root rot (*Fomes annosus*) in Sweden has already been presented [33, p. 190 *et passim*]. The critical problem of the mode of infection is still awaiting solution [36, p. 221]. Contrary to Rishbeth's experience in England [33, p. 190], aerial infection was demonstrated in only 3 to 5 per cent. of the stumps examined by the author.

Trione (E. J.) & Roth (L. F.). **Aerial infections of Port Orford Cedar caused by Phytophthora lateralis.**—Abs. in *Phytopathology*, 46, 11, p. 640, 1956.

Since 1954, Port Orford cedars (*Chamaecyparis lawsoniana*) infected by *Phytophthora lateralis* have developed foliage infections and cankers on the stems and branches, chiefly in the south of the epiphytotic area. Foliage is usually first attacked at the tips of branches near the soil surface, the infection then spreading up the tree. Infection can occur between 2° and 25° C., sporangial formation on the foliage being at intermediate temperatures.

Enos (H. A.). **Economics of preservative treatment of standing Cedar poles.**—*Elect. Light Pwr*, 34, 22, pp. 128–131, 1 graph, 1956.

The development of new techniques for the preservative treatment of standing western red cedar [*Thuja plicata*] poles, combined with the use of stable 10 per cent. pentachlorophenol solutions for this purpose, is expected to effect substantial savings, computed on an experimental basis at an average of $29.60 per pole per annum over a 40-year period, by prolonging the service life of some 40,000 poles on the American Gas and Electric system. The Cobra method of ground-line treatment [34, p. 558], coupled with an improved procedure for top preservation to ensure an average chemical concentration of 0·35 lb. per cu. ft., is considered to offer the most hopeful prospects of effective and durable protection.

Bavendamm (W.). **Untersuchungen über die Möglichkeit einer Abkürzung des Klötzchenverfahrens nach DIN 52176 durch Zusatz von Pepton zum Nährboden.** [Investigation into the possibility of shortening the wood block procedure in DIN 52176 by the addition of peptone to the medium.]—*Holz a. Roh- u. Werkst.*, 14, pp. 181–185, 4 graphs, 1956.

In this investigation at the Federal Research Centre for Forest and Wood Industry, Reinbek, Germany, the author repeated the work of Hof (*Circ. Inst. MatOnderz.*, Afd. Hout 13, Ser. III, 4, 17 pp., 1950) and concludes that the addition of 1 per cent. meat peptone to the standard malt agar approximately doubles the rate at which *Coniophora cerebella* [*C. puteana*] decomposes test wood blocks in the standard technique for the evaluation of wood preservatives (DIN 52176) [cf. 35, p. 857]. The peptone produced abundant mycelial development without affecting the linear growth rate. He considers that a modified and more rapid test could be devised in which the standard malt agar would be fortified with peptone or wood pulp. Increased vigour was not observed with *Poria vaporaria*, *Lentinus lepideus*, or *Polystictus versicolor*.

Broadbent (L.). **Investigation of virus diseases of Brassica crops.**—*Agric. Res. Coun. Rep. Ser.* 14, vii+94 pp., 8 pl., 3 diags., 23 graphs, 2 maps, 1957.

This comprehensive account of the virus diseases of brassicas [cf. 22, p. 49] in Britain, accompanied by 54 references, deals extensively with cauliflower mosaic [36, p. 155] and cabbage black ring spot [35, p. 736], and more briefly with turnip yellow mosaic, turnip crinkle [35, p. 869], and cucumber mosaic [35, p. 79]. Most of the information has already been noticed in this *Review*.

In the greenhouse symptoms of cauliflower mosaic appeared on cauliflower two to four weeks after inoculation; they were masked at temperatures over 24° C. and, with some mild strains, also during the winter. Symptoms of cabbage black ring spot developed in 1½ to three weeks and were more severe above 24°. Most of the serious outbreaks of cauliflower mosaic have recently been associated with the vector *Brevicoryne brassicae*, which is most plentiful in the summer, soon after winter cauliflowers are transplanted. *Myzus persicae*, usually more numerous in the spring, is active in spreading the virus from old crops to seed-beds and newly planted crops. Fifteen to 20 per cent. of winged aphids of both species transmitted cauliflower mosaic after being bred on infected cauliflower plants of various ages and about the same proportion transmitted cabbage black ring spot from younger plants, but from older plants the percentage was much lower.

Cauliflower mosaic is usually more prevalent than cabbage black ring spot owing to its longer retention by aphids and its plentiful occurrence in the newly developed leaves. The virus can spread rapidly, and 0·5 per cent. seedling infection may result in 20 to 40 per cent. infection at harvest. Spread is mainly before early October; infection during September or later does less damage.

Cucumber mosaic virus occasionally affects brassicas, causing slight distortion of turnip leaves but no symptoms in most other crops.

Klug (A.), Finch (J. T.), & Franklin (Rosalind E.). **Structure of Turnip yellow mosaic virus.**—*Nature, Lond.*, 179, 4561, pp. 683–684, 1957.

At the Birkbeck College Crystallography Laboratory X-ray precession photographs were obtained of single crystals of turnip yellow mosaic virus [35, p. 650] deposited from ammonium sulphate solution, and powder photographs of crystals of the related virus protein free from ribonucleic acid. From these a new crystal structure for the virus was deduced, involving 16 particles per unit cell. The particles lie with their centres at the lattice points of a cubic, pseudo-unit cell which has sides of 350 Å, and is body-centred; at low resolution it appears similar in structure to tomato bushy stunt.

Hejndorf (F.) & Dahl (M. H.). **Forsøg med afsvampning af Ærtefrø.** [Experiments in the disinfection of Pea seed.]—*Tidsskr. Planteavl*, 60, 4, pp. 713–720, 1956. [English summary.]

In preliminary tests at the State Phytopathological Experiment Station, Lyngby, Denmark, in 1953, the germination rate of peas sown in frames in steam-sterilized soil appreciably exceeded that of comparable lots in untreated soil, suggesting the presence of some soil-borne pathogen. However, mycological studies revealed only a low incidence of infection by *Ascochyta pisi* or other fungal pathogens. In seed-disinfection experiments performed during 1954–5, captan significantly increased germination. In one field trial, for instance, the percentages attained by samples treated with 50 and 75 per cent. captan dust and by ortho seed-guard (50 per cent. captan+16·5 per cent. lindane) at a dosage of 4 gm. per kg. were 51, 52·2, and 47·8, respectively, compared with 24·8 per cent. for the controls. In a large-scale experiment (one of a series carried out by chemists representing agricultural co-operative societies) a yield increase estimated at 110 kg. per ha. was secured by treatment with 50 per cent. captan at a dosage of 400 gm. per 100 kg. seed.

Hagedorn (D. J.). **Field and laboratory tests of seed protectants for canning Peas.**—*Phytopathology*, 47, 2, pp. 70–72, 1957.

A series of trials was carried out at the University of Wisconsin, Madison, from 1949 to the end of 1953 to test ten protectants on Wisconsin Perfection (and in the last year, Surprise) pea seeds against damping off, primarily due to *Pythium* spp. [cf. 35, p. 502; 36, pp. 80, 153], and to compare the results obtained in greenhouse temperature tanks, a walk-in cold chamber, and in rolled towels with those in the field in different soil types. The protectants were generally used at the dosages recommended by the manufacturers. KF 467 (10 per cent. diethyl mercuric perthiocyanate) and three phygon preparations were the most effective in increasing percentage germination in the first four years, and orthocide 75 in 1953. The four methods used gave on the whole consistent results, but the towel and cold-chamber tests appeared to be more precise than those in the tanks. Dry application of the protectants was generally superior to the slurry method.

Jones (H. A.), McClean (D. M.), & Perry (B. A.). **Breeding hybrid Spinach resistant to mosaic and downy mildew.**—*Proc. Amer. Soc. hort. Sci.*, 68, pp. 304–308, 1956.

After pointing out that downy mildew (*Peronospora effusa*) [cf. 35, p. 806] is the most widespread and destructive disease of spinach [in Texas] and usually occurs in seasons when cool, moist conditions prevail, the authors state that in their breeding work for resistance only dioecious lines were used for the seed parent. In 1949 several backcross lots of seed (Viroflay×P.I. 140467)×Viroflay [loc. cit.] were

obtained from California; these lines were screened for downy mildew resistance, and the non-susceptibles crossed with various smooth-leaved types adapted to conditions in southern Texas. The screening was carried out in the greenhouse at Beltsville, Maryland, in winter. The first inoculation was made with a water suspension of spores when the cotyledons were well developed. Inoculum was obtained from Arkansas, California, Maryland, Texas, and Wisconsin. So far, about 80 smooth-leaved, dioecious resistant lines have been obtained and can be used in hybrid combinations.

Many experimental hybrids have been produced by using these lines as the seed parent and Virginia Savoy, resistant to mosaic (cucumber virus 1 [mosaic virus]), as the pollen parent. One such combination, Early Hybrid 7 [35, p. 649], was released for commercial production in July, 1955. Yield tests in Arkansas and southern Texas demonstrated that it outyields the currently-grown varieties of the savoy type, such as Hicurl, Virginia Savoy, and Bloomsdale, and the smooth-leaved Viroflay.

McKay (R.). **The longevity of the oospores of Onion downy mildew, Peronospora destructor (Berk.) Casp.**—*Sci. Proc. R. Dublin Soc.*, N.S., 27, 12, pp. 295–307, 1 pl., 1957.

A study conducted at University College, Dublin, showed that the oospores of *Peronospora destructor* [18, p. 778] do not develop every year in mildewed onion plants in Ireland, but are produced only occasionally, though in very considerable numbers. They occur more commonly in autumn-sown crops than in spring ones, probably because of the varying nature of climatic conditions in spring rather than the effect of the particular stage of development reached by the host.

After the foliage has decayed and the oospores have become separated from the host, the oogonium shrinks and, with any unused oogonial contents, forms a persistent, protective layer round the oospore. Before most of the oospores will germinate an after-ripening period, usually of several years' duration, is required. The period varies with individual spores, but ultimately the oospores acquire a state of 'secondary dormancy' [cf. 23, p. 184] which, apparently, can persist indefinitely until some necessary stimulus is present, when mass germination results. Oospores from onion debris weathered outdoors were found to have retained their viability unimpaired after 25 years.

Twenty-four crops of onions were raised in soil heavily contaminated with oospores, but not one infected plant appeared. Oospores recovered from this soil after the fifth successive crop were fully viable.

Couto (F. A. D'A.). **Symptoms of mineral deficiency in Garlic.**—*Proc. Amer. Soc. hort. Sci.*, 68, pp. 358–365, 1 fig., 1956.

Descriptions are given of the characteristic symptoms of plant growth of garlic grown (at the Universidade Rural, Vicosa, Minas Gerais, Brazil) in sand culture without nitrogen, phosphorous, potassium, calcium, magnesium, boron, and zinc. Evidence was obtained that the storage leaf supplied some of the nutritional requirements of the plants.

Hepler (P. R.). **Inheritance of resistance to Puccinia asparagi DC. in Asparagus officinalis L.**—*Diss. Abstr.*, 16, 5, p. 849, 1956.

In extensive tests at the University of Illinois on seedlings and three-month-old plants the asparagus varieties Mary Washington, Martha Washington, Waltham Washington, Seneca Washington, Argenteuil, Palmetto, Paradise, California 500, Viking, and Raritan were resistant to *Puccinia asparagi* [cf. 36, p. 81]. Differences in resistance appearing in the progeny of crosses between resistant varieties (R × R) could not be attributed to any specific resistant varieties. Crosses made between

plants selected for resistance from R×R matings were tested by inoculation approximately one week after the emergence of seedling spears. Differences between nine resistant families were pronounced, while those within families were small.

The difference between resistant and highly susceptible populations appeared to be determined by four or five genes; at least one for susceptibility was linked with a dominant gene inhibiting anthocyanin development.

Inoculation of the third or fourth spear of 10 to 12-week-old plants at the 50 per cent. needle (cladophyll) stage proved best for evaluating resistance, provided that only the primary pustules on the spear axis were counted.

Saburova (Mme P. V.). Физиолого-анатомическое обоснование повышения устойчивости Моркови к Склеротинии под влиянием минерального питания. [Physiological-anatomical basis of increasing Carrot resistance to *Sclerotinia* under the influence of mineral nutrition.]—*Trud. vsesoyuz. Inst. Zashch. Rast.* 3, pp. 38–48, 2 figs., 1951. [Received 1956.]

In studies in the U.S.S.R. in 1947 on the resistance to white rot (*Sclerotinia libertiana*) [*S. sclerotiorum*: 34, p. 203] of carrots stored under commercial conditions or inoculated artificially, infection was highest (14·5 per cent.) following the application of fertilizer with extra nitrogen and lowest (4 per cent.) with extra potassium, as against 7·1 per cent. on carrots which had received only the basic fertilizer.

A high nitrogen content of the roots was associated with heavy infection. In infected roots complex organic compounds are hydrolysed into simple ones which are more available to the fungus, this process being reduced by potassium. Potassium also reduces the respiration rate (higher with infection), and consequently also the loss in dry weight of both diseased and healthy roots. Infection was shown to be influenced by the thickness of the natural corky layer on the root surface, which is increased by potassium.

Komuro (Y.) & Yamashita (I.). **Studies on the motley dwarf disease of Carrot caused by an insect transmitted virus.**—*Ann. phytopath. Soc. Japan*, 20, 4, pp. 155–160, 1 fig., 1956. [Japanese, with English summary.]

A virus disease of carrots which appears to be closely related to that caused by the motley dwarf virus in Australia [cf. 36, p. 370] is reported from the Kanto district in Japan. It is transmitted by the aphid *Brachycolus heraclei*, but not by *Myzus persicae*, nor mechanically or by seed. The acquisition period was 1 to 24 hours, and transmission occurred after 24 hours' feeding, the vector remaining infective for 15 days, with no apparent latent period. Carrot was the only natural host of the virus found; celery was experimentally infected.

McKeen (C. D.). **The inhibitory activity of extract of Capsicum frutescens on plant virus infections.**—*Canad. J. Bot.*, 34, 6, pp. 891–903, 1956.

Further investigations at the Science Service Laboratory, Harrow, Ontario, on the inhibitory effect of the expressed sap of chilli pepper leaves on virus infection [cf. 33, p. 705] showed that the resulting decrease in lesions depends on the species inoculated, and not on the viruses used. These were cucumber mosaic on cowpea and *Chenopodium hybridum*, tobacco etch on tobacco and *Physalis peruviana*, tobacco mosaic on *Datura stramonium* and *Nicotiana glutinosa*, tobacco ring spot on cowpea and tobacco, and a ringspot from cucumber [36, p. 371] on all the hosts except *P. peruviana*. Inhibition occurs only when the sap is applied before or at inoculation, and not subsequently; its effect is apparently to inhibit infection rather than the virus.

On cowpea the effect of the chilli sap extended from one primary leaf to inoculations on the opposite primary leaf, which suggests that it acts on the susceptibility

of the host rather than on the virus particles; possible explanations of this action are discussed. It is also indicated that inhibitors may depress the degree of vector transmission.

Assessed by lesions on cowpea, chilli extract has the same inhibitive power as that from spinach [27, p. 58], which is greater than that from cucumber [32, p. 231]. The inhibitive component of chilli sap is thermolabile, resistant to ageing and drying *in vitro*, and does not pass through a cellophane membrane, these properties suggesting a protein. The protein component of chilli sap precipitated by 95 per cent. ethanol or ammonium sulphate is less inhibitory than raw sap.

Jha (A.) & Raychaudhuri (S. P.). **Mosaic disease of Chilli (Capsicum frutescens L.).**—*Indian J. agric. Sci.*, 26, 2, pp. 217–222, 1 pl., 1956.

A mosaic virus disease of chilli occurred at the Agricultural Research Institute, New Delhi [35, p. 279], in 1952. Under field conditions the earliest symptoms were vein clearing in the younger leaves, followed by severe mottling with patches of light and dark green scattered all over the leaf surface. Slight curling, marginal rolling, and stunting of the leaves were sometimes seen. General stunting of the aerial parts is a common feature, and severely affected plants produce few flowers and fruits.

The virus was inactivated by a temperature of 60° C., but not 55°, for ten minutes. Standard samples remained infective after 15 days *in vitro* at room temperature (15° to 33°), but were inactive after 22 days. Infective adults of *Aphis gossypii* [loc. cit.] transmitted infection to nine out of 61 chilli plants on which they were allowed to feed (12 per plant) for seven to ten days. The virus was transmitted by sap inoculation to chilli, tobacco, *Nicotiana glutinosa*, *Solanum nigrum*, *Petunia hybrida*, cucumber, *Cucumis melo* var. *utilissimus*, safflower, *Datura stramonium*, and the potato varieties President and Craigs Defiance, the last three being symptomless. The virus is not seed-transmitted.

The virus appears to differ from all others described on chilli [cf. 8, p. 486; 21, p. 40].

Herold (F.). **Ist eine wirksame Bekämpfung des Salatmosaikvirus möglich?** [Is effective control of Lettuce mosaic virus possible?]—*Saatgut-Wirtschaft 1956*, 11, pp. 307–309, 5 figs., 1956.

Of 171 samples of commercial lettuce seed examined at Neuss-Lauvenburg over the period 1954 to 1956 60 per cent. were free from lettuce mosaic virus [cf. 35, pp. 505, 812] and the level of infection in the remainder ranged from 0·1 to 10·7 per cent. The author considers that effective control of this disease can be achieved by close attention to clean seed production.

El-Din Fouad (M. K.). **Studies on genetic and on chemically induced resistance of Cucumber tissues to Cladosporium cucumerinum (Ell. & Arth.).**—*Meded. Landb-Hoogesch., Wageningen*, 56, 10, pp. 1–60, 4 pl., 19 figs., 1956. [Dutch summary.]

At the Phytopathological Laboratory, Wageningen, the Netherlands, a detailed anatomical study was made of the host–parasite relations of cucumber seedlings inoculated with *Cladosporium cucumerinum* and of the effect of treatment with G 33 [35, p. 911], the roots being immersed in a 100 p.p.m. solution of the compound for 48 hours prior to inoculation. It was concluded that the resistance conferred by G 33 is located both in the cuticle and in the deeper tissues and that the substance is effective only in cells appearing microscopically sound. The effect does not extend beyond the cuticle, and resistance does not appear to be due to plasmatic interaction.

Uptake by the roots of cucumber seedlings of 2,4-dinitrophenol, sodium diethyldithiocarbamate [cf. 35, p. 51], and sodium azide had no effect upon either genetic

resistance or that induced by G 33. On the other hand, narcosis of seedlings by exposure over solutions of 1·5 per cent. ether or 0·25 per cent. chloroform caused the breakdown of genetic resistance in the varieties Mabro and Proso, though these still remained resistant to *Penicillium italicum* and *Botrytis cinerea* (neither of which normally parasitizes cucumber). Narcosis, however, had no effect on the resistance to *C. cucumerinum* conferred by G 33 which, unlike genetic resistance, appears therefore to be unrelated to host metabolism. The expressed sap from resistant varieties and from the uninfected portions of older plants of a susceptible variety (Lange geletros) did not prove inhibitory to the growth of the pathogen in culture.

McKeen (C. D.). **Phomopsis black rot of cucurbits.**—*Canad. J. Bot.*, 35, 1, pp. 43–50, 3 pl., 1957.

A disease of glasshouse cucumbers in Ontario, first observed in 1946, was investigated at the Science Service Laboratory, Harrow, Ontario [33, p. 276]. Similar in symptomatology to that caused by *Mycosphaerella melonis* [34, p. 511; 35, p. 145], for which it was at first mistaken, it was found to be caused by a new species of *Phomopsis*, named *P. cucurbitae*, with pycnidia 140 to 400 μ diameter, α spores 6·8 to 14·5 by 2·8 to 4·2 μ, and β spores 14 to 25 by 1·15 to 1·35 μ.

In 1950 and 1954 the disease was serious in certain glasshouses, but has otherwise been of no great consequence. The mode of transmission of the disease remains obscure. Inoculation of tomato plants failed to infect stems but succeeded with fruits [cf. 30, p. 292, and above, p. 504]. Soil inoculation failed to cause pre-emergence mortality of cucurbits, and a period of saprophytic growth is apparently needed before the fungus becomes parasitic. A number of fungicidal sprays failed to check the spread of the disease on infected plants, but lowering humidity by ventilation did so.

Atkins (F. C.). **La France disease.**—*M.G.A. Bull.*, *1956*, 84, pp. 396–398, 1 fig., 1956.

This article gives in popular terms a short account and discussion of the symptoms of La France disease of mushrooms [cf. 35, p. 809]. Those recognized by Sinden [loc. cit.] are a reduced or scattered first flush, the mushrooms having rounded, thin-fleshed caps on very thin, long stalks, dying when half grown in a rather soft rot, turning light brown; the occurrence singly rather than in clumps of mushrooms in the second flush; the final cessation of production in expanding areas, spreading rapidly to all beds in the same house, even in the absence of direct contact; and the extremely slow, weak growth of cultures made from the rhizomorphs in the compost.

Gathercole (J. A.). **Dactylium or cobweb disease.**—*M.G.A. Bull.*, *1956*, 84, pp. 428, 430, 1956.

It is pointed out that while PCNB controls *Dactylium* [*Hypomyces rosellus*: cf. 35, p. 71] disease of mushrooms it is not effective against *Mycogyne* [*perniciosa*: cf. 35, p. 577]. Dithane Z-78 on the other hand can be used to control both pathogens, *H. rosellus* being severely checked though not eradicated by regular spraying at 1 lb. per 100 gals. Dusting is less effective.

Hiroe (I.) & Nishimura (S.). **Pathochemical studies on Watermelon wilt. Part I. On the wilt toxin, phytonivein produced by the causal fungus.**—*Ann. phytopath. Soc. Japan*, 20, 4, pp. 161–164, 2 figs., 1956. [Japanese, with English summary.]

The toxin, termed phytonivein, produced by *Fusarium bulbigenum* var. *niveum*, causing wilt of watermelon in Japan [cf. 32, p. 331; 33, p. 748], was found to be thermostable, non-volatile, and dialysable. It was isolated from culture filtrates at pH 8·5 after adsorption by carbon, or from dried mycelial mats by elution with

acetone. The solution was concentrated *in vacuo*, adjusted to pH 8·5, and the toxin extracted with ether, precipitated, and recrystallized from acetone. In a 10^{-5} solution phytonivein caused permanent wilting of watermelon seedlings or cut stems.

MATTHEWS (R. E. F.). **Plant virus serology.**—xii+128 pp., 7 pl., 13 diags., 12 graphs, London, Cambridge University Press, 1957. 27*s.* 6*d.*

The primary object of this monograph is to give plant pathologists a brief description of the basis of virus serological methods, with fairly detailed practical instructions for carrying out tests with plant material [cf. 35, p. 273]. The precipitation reaction receives the most extended treatment, but the use of various methods is critically discussed, and suggestions are made for widening their applicability.

Many of the difficulties involved in elucidating the mechanism of serological reactions may be partly due to the fact that mixtures of serologically distinct proteins have been used in much experimental work. Compared with other protein antigens those plant virus nucleo-proteins which can be isolated in substantial amounts are comparatively homogeneous serologically. Turnip yellow mosaic virus [35, pp. 650, 869, *et passim*] has proved very useful, and certain aspects of the precipitation reaction are illustrated by new experimental data obtained mostly with this virus. These experiments may also indicate to immunologists in general the suitability of plant virus nucleo-proteins for certain 'model' experiments.

An introduction is followed by chapters dealing with the preparation of viruses and antisera; types of serological test; routine testing for virus infection; serological tests for determining relationships among plant viruses; the precipitation reaction; the antibody content of sera; methods for estimating virus concentration; the cross-absorption procedure; precipitation in mixed systems; and the applicability of serological techniques. Subject- and author-indexes are provided, and the list of references extends to 117 titles.

SHOICHI (H.). **Methylene blue method for diagnosing virus-infected Potato tubers and other crops.**—*Mem. Fac. Agric. Univ. Miyazaki*, 1, pp. 179–200, 1956. [Abs. in *Chem. Abstr.*, 51, 4, col. 2947 c, 1957.]

A modification of the Wartenburg and Lindau test for dehydrogenases, based on the time required for reduction of methylene blue to a leuco compound [15, p. 822], was used for the diagnosis of virus infection in potato tubers, radish and turnip roots, and broad bean stems in studies at the University of Miyazaki, Japan. The process was accomplished by 10-hour-old sap of infected tubers within one to two hours at 30° C.; a longer period was necessary for the operation of sap from healthy material. The addition of a drop of N potassium hydroxide to the potato sap accelerated the reduction of methylene blue, which was completed in less than one minute by extract from sound tubers and in over three by that from diseased. Infected saps of radish and turnip took longer than healthy ones to reduce methylene blue.

Boiling was found to be non-essential for the diagnosis of virus infection in radish, turnip, or broad bean. The presence of a brilliant yellow or silvery fluorescence in the upper layer of diseased sap after 10 to 20 hours' illumination by ultra-violet radiation is attributed to the riboflavine of bacteria multiplying therein.

Plant quarantine announcements.—*F.A.O. Pl. Prot. Bull.*, 5, 4, p. 65, 1957.

By Ministerial Order No. 986 of 10th November, 1955, published in the *Diario Official* of 24th November, 1955, the importation of potatoes into Brazil is prohibited unless each consignment is accompanied by a phytosanitary certificate and a certificate of origin issued by the competent service of the country of origin and signed by the Brazilian consul at the port of departure. Requirements include

freedom from *Synchytrium endobioticum* [31, p. 350] and *Corynebacterium sepedonicum* [34, p. 314] and, for seed potatoes, field inspection for virus diseases.

The Importation of Plants, Seeds, and Potatoes (Amendment) (Jersey) Order, 1956 [cf. 36, p. 174], which came into force on 12th November, 1956, establishes that carnation cuttings may be landed in Jersey only if the parent plants are known to be free from wilt bacteria (including *Pseudomonas caryophylli* and *Erwinia* sp.) and derived immediately from plants similarly free, or if obtained from countries where such wilts are not known to be established.

Diercks (R.). **Die Saatgutordnung im Blickfeld des Pflanzenschutzes.** [The Seed Order from the standpoint of plant protection.]—*Pflanzenschutz*, 9, 1, pp. 13–16, 1957.

Explanatory comments are made on the provisions (reproduced on p. 20) of the Sixth Order for the Execution of the Seed Statute (Order relating to minimum requirements), promulgated by the Bavarian Ministry of Food and Agriculture on 26th September, 1956, as well as on the Seed Statute itself, which has been in force throughout Federal Germany since 27th June, 1953. The Sixth Order supplements the rules of the Statute for the certification of potato 'seed' by the proviso that the maximum incidence of severe virus infection shall not exceed 6 and 10 per cent. in élite and certified material, respectively [cf. 29, p. 225].

New or uncommon plant diseases.—*Plant Path.*, 6, 1, p. 38, 1957.

A. J. H. Carr reports that in July, 1956, symptoms of infection by *Pseudoplea trifolii* [cf. 33, p. 358; 35, p. 876] appeared on certain spaced, single plants of lucerne at the Welsh Plant Breeding Station, Aberystwyth. Only the progeny of a cross between the Canadian variety Rhizoma and the Aberystwyth-bred S. 205 were affected.

Mary Noble states that a high proportion of red clover seed samples of the 1955 English harvest recently examined in Scotland were infected by *Botrytis anthophila* [cf. 28, p. 176].

Chevaugeon (J.). **Enquête phytopathologique dans le bassin du Cavally.** [A phytopathological investigation in the basin of the Cavally.]—*Rev. Mycol., Paris*, 21, *Suppl. colon.* 2, pp. 57–86, 9 figs., 1 map, 1956.

Brief notes are given (under hosts) on the symptoms, causal organisms, and local geographical distribution of 82 diseases (28 new to the country) of crop plants observed during a preliminary survey in 1955 of the Ivory Coast part of the Cavally river basin [cf. 31, p. 476; 33, p. 757; 36, p. 82, *et passim*]. The region is remote and sparsely populated, and the crops on the whole were remarkably healthy. The only disease of major importance is *Xanthomonas citri* [map 11] on lime. Other records were *Eutypella heveae* on the dead branch tips of *Annona muricata*; *Xanthomonas malvacearum* [map 57] in cotton (*Gossypium arboreum*) pods [cf. 33, p. 674]; *Glomerella gossypii* [map 317] on cotton and *Hibiscus esculentus*; *Helminthosporium heveae* [map 270: 33, p. 758], *Colletotrichum heveae*, and *Gloeosporium albo-rubrum* on *Hevea* rubber; *Hemileia vastatrix* [map 5], common on coffee in the north but disappearing abruptly south of Tai [35, p. 606]; *Cercospora nicotianae* [map 172], rendering tobacco leaves useless; and *Ophiobolus miyabeanus* [map 92] on rice.

The information obtained may prove to be of use when the area is opened up.

Plantesygdomme i Danmark 1954. Årsoversigt samlet ved Statens plantepatologiske Forsøg, Lyngby. [Plant diseases in Denmark 1954. Annual report compiled by the State Phytopathological Experiment Station, Lyngby.]—*Tidsskr. Planteavl*, 60, 4, pp. 553–611, 1 fig., 2 graphs, 1957. [English summary.]

Prepared on the usual lines, this report [cf. 35, p. 350 and next abstract] contains

the following among other items contributed by O. Wagn, M. H. Dahl, H. R. Kristensen, and H. A. Jørgensen. As in the previous year, copper deficiency was prevalent in spring cereals, not only on sandy soils but also on clay in Jutland, where its existence was revealed by a large number of random experiments with copper sulphate as a soil amendment at a dosage of 50 kg. per ha.—the minimum required for reliable results. The symptoms appeared earliest and were most acute in areas heavily fertilized with stable manure, phosphorus, and potassium.

Excellent control was secured by spraying with copper sulphate at the rate of 10 to 15 kg. per ha., even as late as the end of June. The trouble was also observed on the islands of Fünen and Zealand.

Puccinia glumarum was present in a number of wheat fields from the autumn of 1953 onwards, and may have contributed to overwintering losses. The rust was also widespread, but not generally severe, in summer wheat stands. The results of a varietal test demonstrated the greater susceptibility of the French Nord Desprez and Cappelle Desprez as compared with Belgian, German, and Scandinavian wheats.

Black leg of beets (*Pythium* spp., *Phoma betae*, and other fungi) was virulent over an exceptionally wide area, especially in Jutland. The main predisposing factors are excessive acidity of the soil and over-frequent beet cultivation, while others include poor drainage, deficiency of phosphorus, insufficient friability of seed-bed soil, and unduly deep sowing and soil preparation.

Potato wart (*Synchytrium endobioticum*) was notified from nine new municipalities.

Wet weather interfered with spraying operations for the control of potato blight (*Phytophthora infestans*), late attacks of which caused exceptionally heavy damage to the tubers, resulting in yield reductions of economic importance, often ranging from 10 to 20 per cent.

Infection of potatoes by *Erwinia atroseptica* was more severe than for many years, with incidence up to 10 per cent.

Didymella applanata was again prevalent on raspberries and a number of growers experienced difficulties in its control. For the third year in succession *P. infestans*, favoured by the rainy late summer, destroyed large quantities of tomato fruits.

Samples of cucumber attacked by *Colletotrichum oligochaetum*, a rare fungus, were received from three nurseries.

Some lots of tulip bulbs were extensively infected by tobacco necrosis virus [34, p. 576], which often produces unilateral lesions on the leaves, resulting in crookedness and torsion. The floral symptoms are very mild, involving at the most a faint discoloration of the perianth. In sap-inoculation experiments numerous varieties proved to be susceptible, Korneforos, Dronning Ingrid, and Brilliant Star being the most severely attacked.

As usual, *Gymnosporangium clavariiforme* was widely distributed on hawthorn [*Crataegus oxyacantha*], especially in nurseries, where it caused stunting of branches and malformation of shoots.

The following are new records for Denmark. 'Star-cracking', a defect of apples [35, p. 875] which has frequently been reported during the last 10 years, was shown by grafting experiments to be transmitted by scions of the Pederstrup and Beauty of Boskoop varieties. It is undoubtedly a virosis, probably identical with or nearly related to rough skin [35, pp. 774, 775].

Lettuce mosaic virus has certainly been present in the country for some years, but definite proof of its occurrence was obtained only during the period under review. The virus was transmitted from diseased Maikönig plants to healthy lettuce, both by mechanical methods and through the aphid *Myzus persicae*, which in some cases induced the first vein-clearing symptoms in three days. Infection was also conveyed to *Zinnia elegans* and *Gomphrena globosa*.

Pea mosaic virus was observed as long ago as 1926, but was not confirmed until 1954, when the virus was transmitted by sap inoculation to White Burley tobacco, *Tetragonia expansa*, and *G. globosa*. All three species reacted by local lesion development on the leaves, while the last-named also contracted systemic infection.

Symptoms of mosaic on *Aristolochia trilobata* leaves comprise chlorotic lesions and vein-clearing. Sap-inoculation tests induced large local lesions on *Nicotiana glutinosa*, and chlorotic spots on tobacco and cucumber.

The formation on *Calendula officinalis* leaves of roughly circular, chlorotic lesions, which subsequently became necrotic, is attributed to a virus complex, possibly consisting of cucumber mosaic and one of the numerous *Brassica* viruses. Tobacco, *N. glutinosa*, and Chinese cabbage reacted to sap inoculation by systemic infection, while local chlorotic lesions were also produced on tobacco, *T. expansa*, and *Blitum virgatum*.

A virosis of *Peperomia glabrella*, characterized by a prominent yellow mottling of the leaves, induced systemic effects on inoculation into tobacco, *N. glutinosa*, and cucumber, and is doubtless identical with cucumber mosaic virus or one of its many derivatives.

The identity of the viruses affecting *Cymbidium* sp. and *Dicentra spectabilis* has not yet been established.

Corticium fuciforme [cf. 35, p. 681 *et passim*] was found to be responsible for 'pink patch' on a lawn of *Festuca rubra* in a private garden in North Zealand. The reddish colour was caused partly by the red pigment of the infected foliage and partly by the pink, gelatinous hyphae of the fungus. The latter bore bright red, spiniform branches, 5 to 10 mm. in length, from which the organism was isolated and inoculated into its host in the greenhouse with weakly positive results.

The following new fungicides were officially approved: aabeizo 0, evalin, and evan T-53 as cereal seed dressings; aatiram and dana gam for beet seed treatment against black leg; andro copper oxychloride, copper-lime ultra with 90 per cent. copper oxychloride, and kuprisan-K-37 for spraying against potato blight and celery leaf spot (*Septoria apii*); carbatyl against potato blight and apple scab (*Venturia inaequalis*); horlan and kuprotox against apple scab until the 'tight-bud' stage; and BB kvik, hostakwick [35, p. 303], midol-merkuri-55 [cf. 34, p. 527], para-gam with mercury, spontan merkury, BB morfex 90, K.V.K. spray sulphur 80, new spersul, penetrol wettable sulphur 80, carbajern, danatex spray quality, kryptox, midol TMTD, pomarsol 80, uramit, phytozin, midol-ziram, penetrol ziram, and zinc-pomarsol, all for apple scab.

NEERGAARD (P.). **6. Årsberetning vedrørende frøpatologisk kontrol 1 April 1953–31 Maj 1954. 7. Årsberetning verdrørende frøpatologisk kontrol 1 Juni 1954–31 Maj 1955.** [Sixth and seventh annual reports relating to the control of seed pathology from 1st April, 1953, to 31st May, 1954, and 1st June, 1954, to 31st May, 1955.]—17 pp. and 17 pp., 1 fig., Statens Plantetilsyn (Plant Protection Service), København, 1956. [English summaries.]

The horticultural seed samples tested during the two years under review [cf. 31, p. 224] numbered 1,451 and 1,080, respectively. In addition to numerous well-known pathogens, e.g., *Phoma betae* and *Uromyces betae* on different kinds of beet (the latter principally on fodder types and the former also affecting spinach), *Alternaria brassicicola*, *A. brassicae*, and *P. lingam* on crucifers, *Septoria apii* and *S. apii-graveolentis* on celery, and *Stemphylium radicinum* and its var. *petroselini* on carrot and parsley, respectively, represented in both periods, the following items may be mentioned. In 1953–4 one lot of chilli (apparently a new host) harboured 16 per cent. infection by *P. destructiva*, and *Passalora kirchneri* [*Phoma anethi*: loc. cit.] was detected in a sample of parsley.

Opium poppy and *Papaver rhoeas* were infected by *Pleospora calvescens* in both

years. *Dendryphion penicillatum* var. *sclerotiale* [31, p. 85], a new record for Denmark, occurred in samples of both species in 1953–4 and in *Papaver rhoeas* only in 1954–5.

Ciboria alni was found in a sample of alder in 1953–4.

The (unpublished) results of a comparative study of type material by H. Andersen indicate that the species of *Helminthosporium* commonly attacking Danish grass seed is not *H. siccans* [cf. 28, p. 127; 34, p. 805], as stated in previous reports, but *H. catenarium*, which was detected in both years in *Festuca pratensis*, *F. rubra*, *Lolium multiflorum*, *L. perenne*, *Poa pratensis*, and *P. trivialis*; in 1953–4 it was also present in *Phleum pratense*. In 1954–5 the last-named was a host of *H. dictyoides* var. *phlei* [34, p. 651], a new record for the country, while a sample of *Poa pratensis* yielded *Claviceps purpurea*.

Other new records (all of 1954–5) include *Phoma berberidis* (probably a synonym of *Phyllosticta berberidis*), isolated from barberry (*Berberis thunbergii* [var.] *atropurpurea*) seeds; celery and parsnip as hosts of *A. porri* f.sp. *dauci* [*A. dauci*]; and *Phomopsis occulta* [cf. 34, p. 613] on larch (*Larix leptolepis*).

Thirty-seventh Report of the Quebec Society for the Protection of Plants, 1955.—164 pp., 9 pl., 3 diags., 5 graphs, 1956. [Received 1957.]

In this report [cf. 35, p. 749] W. N. Keenan (pp. 36–39) gives a useful summary of the more important Canadian plant protection regulations, both domestic and foreign.

D. Leblond (pp. 40–42) reports [in French] on the fungicide trials at Ste-Foy in 1954, where Bordeaux mixture, C.O.C.S. spray, captan, manzate, and phygon XL were tested against various tomato diseases. The best results, both as regards yield and preventive control, were given by orthocide 406, 3¾ lb. per 100 gals.

E. Campagna (pp. 47–63) discusses [in French] the resistance of 64 potato varieties to blight (*Phytophthora infestans*) [34, p. 56] at Ste-Anne-de-la-Pocatière during the 1954 epidemic, and summarizes (pp. 64–73) the results of fungicide trials held there at the time, in which the following six preparations were tested against *P. infestans* (seven applications between 12th July and 9th September): Bordeaux mixture 10–10–100, 10–5–100, and 5–25–100, C.O.C.S., manzate, and dithane Z-78. Bordeaux mixture 10–10–100 and 10–5–100 and C.O.C.S. gave the best results, reducing leaf infection on 1st October to 1 per cent. or less, as compared with over 90 in the controls, with tuber infection between 3 and 6 per cent., as opposed to 39. The same author describes (pp. 74–84) his visit to the counties of Gaspé-sud, Bonaventure, Matapédia, and Matane in 1954, where he calculated the average percentage of potato leaf infection by *P. infestans* in individual fields of a large number of parishes in each county. The highest rate (93 per cent.) was in the Bonaventure parish of Bonaventure county. Several parishes in Matapédia were free from infection.

H. Généreux (pp. 85–87) discusses [in French] foliage and tuber resistance of various potato varieties to *P. infestans*. Keswick foliage was more resistant than that of Kennebec. Montagne Verte and Placid had 13 and 20 per cent. affected tubers, respectively, while those of Kennebec, Virgil, and Chisago were unaffected. At Ste-Anne-de-la-Pocatière, the highest foliage resistance was shown by Empire, Virgil, and Sebago, while the most resistant tubers were those of Sebago, Ontario, and Dakota Rouge.

E. Lavallée (pp. 147–149) contributes a brief note [in French] on the relationship of potato blight to weather conditions at St. Martin in 1953 and 1954.

Annual Report, Cawthron Institute, Nelson, New Zealand, 1955–56.—57 pp., 1956.

In the section of this report [cf. 35, p. 282] dealing with black root rot (*Phytophthora cactorum*) of hops (p. 21) reference is made to the experiments carried out at the Hop Research Station from 1951 to 1954, the results of which have already

been noticed [36, p. 211]. In a soil sterilization trial with dithane, started in 1954, no difference was noted at the end of 1955 in the comparative percentages of healthy plants in treated and untreated areas. In culture studies of the nutritional requirements of *P. cactorum* growth was satisfactory without phosphorus, but not without potassium or nitrogen.

Further investigation by H. O. Askew and Joyce Watson (pp. 45–47) confirmed the association of previously noted leaf disorders of hops with molybdenum deficiency.

In inoculation studies on the resistance of tobacco to *P. parasitica* [34, pp. 213, 215], Harrison's Special 215 and Virginia Gold proved susceptible, but 100 per cent. resistance was shown by Dixie Bright 102, 93 by Florida 301 R.G. and Vesta II, 86 by Vesta 46, and 79 by Oxford I and Oxford III.

Physiological disorders of tomatoes are classified by D. J. Stanton (pp. 50–52) in three groups [cf. 29, p. 178], all except leaf-twist being disorders of the fruit. Group A comprises disorders such as greenback [loc. cit.] and hard core [34, p. 214], which are characterized by hard, non-ripening tissue, mainly at the stem end, and tend to be promoted by unbalanced growth, especially when associated with low potassium assimilation and translocation. These disorders are frequently associated with Groups B and C. Group B includes blossom end rot, which seldom appears on plants affected by Group C disorders. Group C is subdivided into: (*a*) disorders such as blotchy ripening [cf. 35, p. 493], cloud or vascular browning [33, p. 645], greywall [cf. 36, p. 283], bronzing [cf. 29, p. 587], pockets, and puff, which are characterized by irregular blotchy areas during ripening, vascular necrosis, and granular corky cells surrounding the vascular tissue; (*b*) those characterized by scars, either on the fruit, as in catface and fruit splitting, or on the petiole, as in leaf-twist. These disorders are unlikely to develop together with blossom-end rot in a single crop at a particular period, such an occurrence indicating extreme nutritional disequilibrium or severe environmental fluctuations. Many C disorders, such as blotchy ripening, are associated with excessive growth. Adequate utilizable potash is needed for crops susceptible to hard core.

The causal agent of a leaf decay of tobacco during curing at Riwaka was identified by Ethena E. Walker (pp. 54–55) as *Rhizopus arrhizus* [cf. 35, p. 400], a new host record for New Zealand.

Thirtieth Annual Report of the Department of Scientific and Industrial Research, New Zealand, 1956.—73 pp., 1956.

Agricultural research is dealt with on pp. 9–18 of this report [cf. 35, p. 282]. The use of tissue culture to eliminate potato virus Y has been noticed from another source [35, p. 629]. The Green Feast pea variety, resistant to pea wilt [*Fusarium orthoceras* var. *pisi*: 36, p. 444], was released for sale.

In studies on the association of *Phytophthora cinnamomi* with mortality of *Pinus radiata* in shelter belts, the percentage infection of soil samples from diseased and healthy pine rows and from adjacent fields varied from between 0 and 10 per cent. in open fields to 80 in the root zones of affected belts. Strains of *P. cinnamomi* have been proved parasitic to one- and two-year-old *P. radiata*, but climatic and soil factors also appear concerned in the death of the trees.

A virus disease of clover, similar to a disease recorded in North America, is especially widespread in old pastures on North Island. Although generally symptomless it was shown in greenhouse trials to cause losses of up to 25 per cent. in white clover (which may have some resistance), 35 per cent. in subterranean clover, and 50 per cent. in red clover.

In breeding experiments for resistance to *Phytophthora* root rot of hops [*P.* ? *cactorum*: see preceding abstract] 2,000 seedlings from crosses made in 1952–3 were artificially infected and the 1,200 survivors planted out. Five or six plants of these

showed high yield and cone quality. Other experiments indicated that root rot is increased by the use of organic sources of nitrogen as fertilizers.

E. J. Godley (pp. 36–38) outlines the work planned by the Crop Research Division, which includes breeding for disease resistance and investigation of allied problems, and a wheat disease survey. G. H. Cunningham summarizes, without giving details, the projects of the Plant Diseases Division (pp. 55–59).

Mysore Agricultural Calendar and Year Book, 1955.—iii+264 pp., 7 pl., 3 diags., Bangalore, Bangalore Press, 1956.

On pp. 147–152 of this publication [cf. 34, p. 517] S. Usman contributes a general account in popular terms of insect transmission of plant diseases, with examples of virus, bacterial, and fungus diseases transmitted in India.

Important diseases of the chief food crops in Mysore described by N. S. Venkatakrishniah (pp. 163–176) include *Ustilaginoidea virens*, *Sclerotium oryzae*, and *Cladosporium oryzae* [cf. 12, p. 146] on rice; *Sphacelotheca cruenta* [4, p. 465], *Tolyposporium ehrenbergii* [33, p. 525], *Puccinia purpurea*, *Colletotrichum graminicola* [27, p. 315], and *Sphacelia sorghi* [? *Claviceps* sp.: 27, p. 561] on sorghum, and *Sclerospora graminicola*, *Uromyces setariae-italicae* [35, p. 97], and *Ustilago crameri* [32, p. 177] on *Setaria italica*.

The same author also describes some of the common fruit diseases in Mysore (pp. 177–188). Those of mango include *Oidium mangiferae*, *Pseudomonas mangiferae-indicae* [29, p. 161], and *Gloeosporium mangiferae*. *Corticium* [*Sclerotium*] *rolfsii* [cf. 33, pp. 185, 524] causes pseudostem rot of plantain [banana] on isolated stools, producing discoloured patches on the leaf sheath with a straw-coloured centre and reddish-brown margin. Infection penetrates inwards and the pseudostem may split; wilting of the leaves ensues. Plantains are also attacked by *Fusarium oxysporum* f. *cubense*. Oranges are affected by *Oidium* sp. [26, p. 101], fruit rot and gummosis due to *Phytophthora* spp., nutritional chlorosis (often iron or zinc deficiency), and *Colletotrichum gloeosporioides* [*Glomerella cingulata*]. Pomegranate is affected by fruit rot due to *Phomopsis* sp., and papaw by a stem and collar rot (due to *Pythium* sp.) [34, p. 606] and anthracnose (*Gloeosporium* sp.). Apple is subject to a stem rot (*Schizophyllum* sp.) and to *Podosphaera leucotricha*. Diseases of grapes [cf. 36, p. 86] include *Uncinula necator*, *Gloeosporium ampelophagum* [*Elsinoe ampelina*], and *Phakopsora vitis* [*Angiopsora ampelopsidis*]. Also noted are rust (*Cerotelium fici*) on fig, an occasional rot of the leaf bases and fruit of pineapple due to *Phytophthora* sp., and soft rot of jak fruit caused by *Rhizopus artocarpi* [28, p. 530].

Annual Report of the Department of Agriculture, Tanganyika, 1955 (Part II).—96 pp., 3 graphs, 1956.

In this report [cf. 35, p. 163] information by M. H. Arnold (pp. 12–18) on bacterial blight (*Xanthomonas malvacearum*) of cotton has mostly been noted from another source [35, p. 890]. Experiments indicated that trash-borne infection had little effect on yield. Different conditions at germination may affect considerably the incidence of disease in seedlings grown from the same bulk of seed and correlation was observed between incidence and soil fertility. Seed treatment effects appear to persist in the region of the cotyledonary node and to some extent in the rest of the main stem. Wilt (*Fusarium oxysporum* f. *vasinfectum*) [*F. vasinfectum*] occurred again in Geita district but did not spread [35, p. 367].

E. A. Riley (pp. 47–48) reports from Lyamungu further sporadic occurrence of panama disease [*Fusarium oxysporum* f. *cubense*] of bananas [34, p. 350] in the Kilimanjaro area, an outbreak being also recorded in the Arusha district. A new disease of beans [*Phaseolus* ? *vulgaris*] known as 'oily pod', which became more widespread in 1955, is believed to be of virus origin. Symptoms, which are highly

variable, include an oily feel and dark colour of mature pods and a fusty smell when the pods break open. On young plants there is interveinal chlorosis of leaves, tip die-back of branches, and a puffy feel to pods. The disease has also been seen in Uganda. Grafting and inoculation experiments were unsuccessful. Grey leaf spot (*Stemphylium solani*) of tomato [35, p. 164] caused further damage in the Muheza district.

N. B. Joy (pp. 49–53), reporting from Arusha, states that the incidence of pink ear rot [*Gibberella zeae*: 30, p. 563] of maize was unusually high, the worst areas being Olmotonyi and Usa River. As the fungus can apparently be wind-borne for long distances continuous control over a wide area is necessary. Maize head smut [*Sphacelotheca reiliana*: cf. 34, p. 364] was again widespread, and incidence of stem rust (*Puccinia graminis*) [32, p. 117] of wheat was high. *Peronospora viciae* [cf. 31, p. 537] on peas and cucumber mosaic virus on cucumber were new records for Tanganyika Territory.

Among notes on experiments carried out in 1955 in Tanga Province (pp. 92–96) it is stated that the potato variety 1521 c(3) was unaffected by *Phytophthora infestans* [34, p. 352] for the thirteenth successive planting since importation. In tests of 22 cassava varieties for yield and resistance to virus diseases the Amani bred varieties [cf. 31, p. 421] proved generally more resistant than the local ones, though some gave poor yields; Amani variety 4723 A/26, which was both mosaic-resistant and palatable, yielded 19 tons per acre 16 months after planting, more than triple the yield of any other variety tested.

Nance (Nellie W.). **Some new and important plant disease occurrences and developments in the United States in 1955.**—*Plant Dis. Reptr, Suppl.* 241, pp. 196–229, 8 maps, 1956.

Most of the information contained in this report [cf. 35, p. 751] has already been noticed from other sources.

Downy mildew of cucurbits (*Pseudoperonospora cubensis*) [35, p. 810] spread westward from the Atlantic Coast States to Indiana and also to Kentucky, where it was recorded on cantaloupe for the first time for many years.

Lioret (C.). **Les acides aminés libres des tissus de crown-gall cultivés in vitro. Mise en évidence d'un acide aminé particulier à ces tissus.** [The free amino acids of crown gall tissues cultured *in vitro*. Demonstration of an amino acid peculiar to these tissues.]—*C.R. Acad. Sci., Paris*, 244, 16, pp. 2171–2174, 1957.

Among the free amino acids revealed by chromatographic analysis in the crown gall (*Agrobacterium tumefaciens*) tissues of *Scorzonera hispanica* [31, p. 544], tobacco, *Helianthus tuberosus*, and *Ampelopsis hederacea* was a new one, present in great abundance, which is in course of identification.

Scott (R. W.), Burris (R. H.), & Riker (A. J.). **Non volatile organic acids of crown galls, crown gall tissue cultures and normal stem tissue.**—*Plant Physiol.*, 30, 4, pp. 355–360, 1 graph, 1955. [Received 1956.]

At the University of Wisconsin, Madison, crown gall (*Agrobacterium tumefaciens*) tissue from sunflower [35, p. 752] was grown in a liquid medium containing reagent grade sucrose, and the individual organic acids from normal stems, the galls; in addition crown gall tissue cultures of marigold (*Tagetes erecta*), periwinkle (*Vinca rosea*), sunflower, and tomato were determined chromatographically.

Fumaric acid was a major constituent of acids from *T. erecta* and sunflower, and an unidentified acid was prominent in developing *T. erecta* and sunflower stems. There was no appreciable difference in the acids contained in gall and growing stem tissues of the same species, greater differences being found in the amounts of individual acids in normal and gall tissues. Periwinkle and sunflower tissues

contained unusually large amounts of α-ketoglutaric acid, which was insignificant elsewhere.

Leach (J. G.), Lilly (V. G.), Wilson (H. A.), & Purvis (M. R.). **Bacterial polysaccharides : the nature and function of the exudate produced by Xanthomonas phaseoli.**—*Phytopathology*, 47, 3, pp. 113–120, 4 graphs, 1957.

The viscous matrix exuded by *Xanthomonas phaseoli* when grown on agar or in aerated liquid media with glucose or other sugars was studied at West Virginia University, Morgantown. It is similar to the exudate formed on infected beans [*Phaseolus vulgaris*] and it appears to be an acidic heteropolysaccharide of very high molecular weight. It behaves as a hydrophilic colloid, contains bound water, and is moderately hygroscopic. It is clearly distinguishable from those isolated from *X. phaseoli*, *Erwinia carotovora*, and *Agrobacterium tumefaciens* by other workers [24, p. 271; 31, p. 55].

Measuring survival by bacterial counts and by weighing small quantities of the exudate on cover glasses the author found that when stored in the exudate under a variety of conditions appreciable numbers of *X. phaseoli* survived for up to 1,325 days. The thermal death point of the pathogen is slightly higher in exudate than in nutrient broth; ultra-violet absorption by the crude exudate indicates its potential protective qualities against natural light injury to the bacterium.

The exudate caused equal wilting of excised tomato, sunflower, and bean seedlings, and this lack of specificity, together with the reversibility of the wilting in the early stages, its occurrence only with concentrations of noticeable viscosity (0·05 per cent.), and the low water uptake by the seedlings, suggested a mechanical water stoppage rather than a chemical toxicity.

Watson (Marion A.) & Mulligan (T.). **Cereal yellow dwarf virus in Great Britain.** —*Plant Path.*, 6, 1, pp. 12–14, 1 fig. (between pp. 18 and 19), 1957.

In studies at Rothamsted Experimental Station on cereal [barley] yellow dwarf virus [cf. 36, p. 91] *Metapolophium* (*Macrosiphum*) *dirhodum* and *Sitobium fragariae* from wheat and barley were fed for several days on barley plants with many yellowed leaves and retarded ear emergence, found growing on the Rothamsted farm in 1954. When these aphids were then transferred to barley seedlings raised in the greenhouse, the test plants became yellowed. That such yellowing was not due merely to insect feeding was shown by substituting *Myzus circumflexus*, maintained in the glasshouse on broad bean, which did not cause it. Such plants were larger and matured more quickly than those colonized by the same aphid from yellowed barley. Later, after a few transfers with *Rhopalosiphum padi*, more severe symptoms developed. Of the aphids tested, the only one named also in America as a vector was *Metapolophium dirhodum*. The degree of discoloration and dwarfing depended upon the age of the plant when infected, the time of observation, and probably on the strain of the virus.

In a small field experiment in which *R. padi*, fed for a week on infected barley, was allowed to feed on Plumage Archer barley in muslin cages, there was some initial stunting of early-infected plants (25th April to 2nd May) but little difference in appearance at harvest between the infected and the control plots. However, plants infected on 25th April lost nearly 40 per cent. of their grain yield, though those infected a week later lost only about 20 per cent. The virus seems widely distributed in England and Wales and has been found on *Phleum pratense* and *Lolium perenne*.

Hansen (L. R.) & Aastveit (K.). **Forgrødeforsøk på fotsykesmittet jord.** [Crop rotation experiments on foot-rot infected soil.]—*Norsk Landbr.*, *1957*, 7, pp. 139, 142, 1 fig.; 8, pp. 157–159, 3 figs., 1957.

This is a tabulated survey of experiments carried out in eastern Norway during 1956 to determine the effects of the preceding crops in a rotation on the incidence of *Ophiobolus graminis* and *Cercosporella herpotrichoides* on Norrøna wheat and Domen barley [35, p. 754]. The average incidence of infection by *O. graminis* (the extent of the damage caused by the other fungus has not yet been accurately assessed) on the two hosts was 45·5 and 35·1 per cent., respectively. Both suffered heavy yield reductions when preceded in the rotation by the same cereals.

Neither fungus attacked Blenda oats in the present series of trials, and this crop may therefore be recommended as a forerunner of wheat or barley. Even more suitable, on account of their herbicidal action, are the oleaginous plants, rape and mustard, especially in fields infested by couch grass [*Agropyron repens*], but their cultivation presents certain difficulties.

Lindquist (J. C.). **The hosts of Puccinia graminis in Argentina and Uruguay.**—*Robigo, 1956*, 2, pp. 5–6, 1956. [Spanish translation.]

The wild hosts of *Puccinia graminis* represented in the Spegazzini Botanical Institute, La Plata, are listed, and include 19 from Argentina and 11 from Uruguay. In Chile only four such hosts are known.

Johnston (C. O.). **Use of 'hot caps' to start early rust infections in the field.**—*Robigo, 1956*, 1, p. 10, 1956. [Spanish translation.]

At the Kansas State College, Manhattan, cone-shaped covers of heavy waxed paper, about 1 ft. in diameter and 6 in. tall, have proved highly successful for establishing early field infections on seedling wheat with leaf rust [*Puccinia triticina*] and oats with crown rust [*P. coronata*]. After spraying with a spore suspension covering overnight ensures infection.

Santiago (J. C.). **The importance of the single-spore technique on rust work.**—*Robigo, 1956*, 2, pp. 11–12, 1956. [Spanish translation.]

In studies at the Plant Breeding Station, Elvas, Portugal, on 50 single-spore isolates of *Puccinia graminis* [from wheat] a large number of biotypes was found within each physiological race. It is concluded that race differentiation is more satisfactorily obtained by single-spore than by single-pustule culture, which may not, in fact, represent a clonal line. The regular use of the former is recommended for breeding rust-resistant wheat.

Santiago (J. C.). **Probable source of inoculum for Wheat stem rust epidemics in Portugal.**—*Robigo, 1956*, 1, pp. 5–6, 1956. [Spanish translation.]

The overwintering of wheat stem rust (*Puccinia graminis*) in areas of southern Spain [34, p. 356], from which prevailing winds blow towards Portugal, suggests that late-season epidemics of *P. graminis* in Portugal [see preceding abstract], where no rust-resistant varieties are at present available, come from Spain. The author advocates international co-operation in countering rusts and the growing of resistant varieties in regions where overwintering commonly occurs.

Sears (E. R.), Loegering (W. Q.), & Rodenhiser (H. A.). **Identification of chromosomes carrying genes for stem rust resistance in four varieties of Wheat.**—*Agron. J.*, 49, 4, pp. 208–212, 1957.

In co-operative investigations by the Field Crops Research Branch, Beltsville, Maryland, and Missouri Agricultural Experiment Station, Columbia, lines of wheat representing substitutions (singly) of all the chromosomes in Chinese Spring by the corresponding ones in Hope, Thatcher, Red Egyptian, and Timstein were tested for resistance to up to 26 cultures of *Puccinia graminis* [36, p. 179 and next abstract], representing races 11, 15, 17, 19, 29, 32, 36, 38, 44, 49, 56, 59, 111, 125,

and 139. Chromosomes VIII and XVII from Hope, III, XIII, and XIX from Thatcher, VI, XIII, and XX from Red Egyptian, X from Timstein, and XI from Chinese were found to carry genes for resistance to one or more of the cultures. Evidence was found in other chromosomes of modifiers of resistance.

NYQUIST (W. E.). **Monosomic analysis of stem rust resistance of a common Wheat strain derived from Triticum timopheevi.**—*Agron. J.*, 49, 4, pp. 222–223, 1957.

At the Department of Agronomy, University of California, Davis, the duplicate dominant genes for resistance to stem rust [*Puccinia graminis*] in C.I. 12633 wheat were located on chromosome XIII by the use of the monosomic series in Chinese Spring wheat [see preceding abstract]. It can be inferred that the associated resistance to powdery mildew [*Erysiphe graminis*] [34, p. 27] is also on chromosome XIII. Both genes differ from those in Timstein, which has two dominant complementary genes on chromosome X for resistance to race 56 of stem rust [36, p. 93].

PUGSLEY (A. T.). **Resistance of Oro Wheat to stem rust.**—*Robigo, 1956*, 2, pp. 12–13, 1956. [Spanish translation.]

At the Agricultural Research Institute, Wagga Wagga, New South Wales, wheat varieties, including Oro and Baart and also the F_2 and F_3 families of an Oro × Baart cross, which were being tested in 1955–6 for resistance to bunt (*Tilletia caries*), became exposed to a natural epidemic of stem rust (*Puccinia graminis*). Baart proved susceptible but Oro was highly resistant to the rust, a resistance apparently not previously reported; from the behaviour of the F_2 and F_3 it apparently stems from one dominant gene.

JOHNSON (T.) & PETURSON (B.). **How far north can leaf rust of Wheat overwinter?** —*Robigo, 1956*, 1, pp. 4–5, 1956. [Spanish translation.]

The latest evidence available at the Plant Pathology Laboratory, Winnipeg, Canada, indicates that leaf rust of wheat (*Puccinia rubigo-vera tritici*) [*P. triticina*: 36, p. 93] can overwinter at Winnipeg in favourable seasons, as far north as winter wheat can be grown. There is no evidence, however, that *P. graminis* can overwinter in Canada.

WAHHAB (A.). **Incidence of rust on irrigated Wheat as affected by time of sowing and rate and time of nitrogen fertilization.**—*Agron. J.*, 49, 4, pp. 185–187, 1957.

The incidence of rust (*Puccinia graminis* [cf. 28, p. 516], *P. glumarum*, and *P. rubigo-vera tritici* [*P. triticina*]) on irrigated C 591 wheat at Lyallpur Agricultural Farm, West Pakistan, in 1954, was affected independently by the amount of nitrogen (as ammonium sulphate) and time of application. The latter factor affected only the low and medium levels of infection (up to 70 per cent.), later applications contributing most to the medium amounts. Infection increased with rising rate of application (0 to 60 lb. nitrogen per acre), though not proportionately. Better yields followed 30 lb. nitrogen per acre than 60 lb., because of the greater rust incidence at the higher rate.

BALCAZAR (M. Z.). **Herencia de la 'resistencia de planta adulta de Trigo' a la roya amarilla Puccinia glumarum (Schm.) Eriks. & Henn., bajo condiciones de campo.** [Inheritance of 'resistance of the mature Wheat plant' to yellow rust *Puccinia glumarum* (Schm.) Eriks. & Henn. under field conditions.]—*Rev. Fac. Agron. Medellín*, 18, 50, pp. 1–63, 1956.

Many of the papers consulted by the author in the preparation of this thesis have already been noticed in this *Review*. Yellow rust (*Puccinia glumarum*) is responsible for losses of economic importance in the Colombian wheat crop [35, p. 166], espe-

cially in the regional Bola Picota variety, and is the most formidable disease in the wheat belts of Cundinamarca, Boyaca, and Narino. The object of the present studies, which were conducted within the framework of the Wheat Improvement Programme, was to determine the mode of inheritance of mature-plant resistance to the disease by an analysis of the reactions of the segregating F_2 and F_3 progeny of crosses between the highly resistant Frontana and Chinese 166 varieties and the susceptible Supremo 211 and Timstein.

Resistance appeared to be dominant in the resistant varieties and transmissible by a genetic factor operating independently. Frontana conferred a higher degree of definite (as opposed to moderate) resistance on the hybrid progeny than did Chinese 166 and is therefore better suited for use as a progenitor in breeding operations, especially in combination with Supremo 211.

Millerd (Adele) & Scott (K). **A phytopathogenic toxin formed in Barley infected with powdery mildew.**—*Aust. J. Sci.*, 18, 2, pp. 63–64, 1955.

In studies at the University of Sydney, New South Wales, into the nature of the agent uncoupling respiration from its normally associated phosphorylations in the leaves of barley plants infected by *Erysiphe graminis* [36, p. 95], semi-resistant B 69 plants were inoculated with the fungus by White and Baker's method [34, p. 362], the leaves harvested 96 hours later, the fungus brushed off, and the leaves then stored at −15° C. Extracts prepared from this material with 0·05 M potassium dihydrogen phosphate markedly increased the respiration of leaf tissue of the highly resistant B 278 variety, though extracts similarly prepared from non-infected tissue did not. Water extracts of infected tissue were ineffective.

The substance was partially purified by paper chromatography. The eluate obtained from the paper by potassium dihydrogen phosphate brought about increased respiration of leaf tissue. When 0·05 ml. of this fraction was applied to the base of the first leaf of B 278 barley, a visually detectable reaction occurred within 24 hours, and permanent wilting, culminating in necrosis of the top five to six cm., resulted within 48 hours. It is suggested that this partially purified substance is a vivotoxin [33, p. 106].

Sabet (K. A.). **A note on the identity of a bacterium causing stalk rot and leaf blight of Maize in Southern Rhodesia.**—*Emp. J. exp. Agric.*, 25, 98, pp. 165–166, 1957.

At the University of Khartoum, Republic of the Sudan, a close resemblance was found between a bacterium causing stalk rot of maize in Southern Rhodesia and an isolate of *Erwinia carotovora* f.sp. *zeae* from maize near Cairo [33, p. 478]. Both produced similar disease symptoms on four varieties of maize; the effects of inoculation on sorghum and sweet corn resembled those on maize. The Rhodesian organism generally produced acid and gas more slowly than the Egyptian.

It is concluded that the Rhodesian pathogen is *E. carotovora* f.sp. *zeae*. The bacterium described by Ludbrook as causing top rot of maize [22, p. 95] in Australia may also be the same, as it has many characters in common with the Egyptian and Rhodesian strains.

Stanton (W. R.) & Cammack (R. H.). **Studies on Puccinia polysora in West Africa.**—*Robigo, 1956*, 2, pp. 19–21, 1956. [Spanish translation.]

The West African Maize Research Unit, Ibadan, Nigeria, reports the discovery of a gene, provisionally designated Rpp_2, derived from the Mexican maize varieties San Luis Potosi and Coahuilla 8, which confers resistance to races 1_{ea} and 1_{wa} of *Puccinia polysora* [35, p. 165]. A gene from a Colombian variety confers hypersensitive resistance to race 1_{ea} and susceptibility to race 2_{ea}. The identity of races 2_{ea} and 2_{wa} is not yet determined, as lines containing Rpp_1 gave anomalous results

in West Africa. Several Trinidad lines were generally resistant to racially mixed infections in the field.

A list is appended of the world spread of *P. polysora* [map 237] and the year of its first recording in new areas, Thailand being included for 1956.

Jennings (P. R.) & Ullstrup (A. J.). **Host-parasite relations of Corn infected with Helminthosporium carbonum Race I.**—Abs. in *Proc. Ind. Acad. Sci.*, 65 (*1955*), p. 54, 1956.

In studies at Purdue University spore germination of *Helminthosporium carbonum* [35, p. 444] and initial infection stages were similar on leaves of both susceptible and resistant single crosses of maize. Extensive necrosis of susceptible mesocotyl and tassel neck tissues was unaccompanied by host reactions, while in resistant tissues there was immediate cellular collapse resulting in shallow pit formation. Hyphae were completely inhibited shortly after penetration of a few epidermal and cortical cells. Fungus procession was not impeded by the formation of lignitubers, present in both varieties. In the susceptible varieties hyphae completely parasitized the chlorenchyma round the penetration site but did not extend to lesion borders. On resistant leaves minute chlorotic spots formed; hyphal growth in epidermal cells was rapidly inhibited but hyphae remained viable for at least 60 days. Pear-shaped, safranin-stained droplets of unknown composition were consistently deposited in all parasitized resistant tissues. Absence of morphological barriers in response to penetration of resistant tissues indicated that in maize resistance to *H. carbonum* is biochemical.

Jenkins (Merle T.), Robert (Alice L.), & Findley (W. R.). **Genetic studies of resistance to Helminthosporium turcicum in Maize by means of chromosomal translocations.**—*Agron. J.*, 49, 4, pp. 197–201, 1957.

At the Field Crops Research Branch, United States Department of Agriculture, reciprocal translocations were utilized to identify the chromosome arms associated with resistance to maize leaf blight (*Helminthosporium turcicum*) [33, p. 478]. In the resistant Mo21A inbred eight arms were associated with resistance and two with susceptibility. The short arm of chromosome 1 was associated with resistance in some tests and susceptibility in others. In tests with the resistant line NC 34 resistance was associated with six chromosome arms.

Burke (J. H.). **Citrus industry of British Honduras, Jamaica, Trinidad.**—*Foreign Agric. Rep.* 88, 77 pp., 40 figs., 3 maps, 1956.

This report on the citrus industry as a whole refers *inter alia* to diseases. The most important citrus disease in British Honduras (pp. 5–8) is gummosis [*Phytophthora* spp.: cf. 36, p. 381 and map 302], which attacks older trees and is most active in heavy soils. Psorosis virus [map 65] is reported on oranges. Old grapefruit groves are affected by a rapid spreading decline of unknown cause but found not to be due to tristeza virus [32, p. 66]. Citrus scab [*Elsinoe fawcetti*: map 125] is commonly present.

P. parasitica [cf. 36, p. 316] is widespread in old grapefruit orchards in Jamaica (p. 29) and is reported to be causing the death of seedling orange trees. Psorosis virus is also to be seen on older grapefruit trees there. A new, unidentified fruit disorder known as 'brown stem', or 'stem end burn', characterized by browning of the peel round the stem, is causing concern, as the browning spreads during processing.

Some of the information on citrus diseases in Trinidad (pp. 56–58) has already been noticed [36, p. 27]. Incidence of *P. parasitica* is high; scab [loc. cit.] may cause severe damage to grapefruit in areas of heavy rainfall; and melanose [*Diaporthe citri*: cf. 30, p. 310] is present in most groves, being apparently more destructive on grapefruit than on orange. Psorosis virus was also observed in Trinidad.

Klotz (L. J.). **Mal secco disease of Citrus.**—*Bull. Calif. Dep. Agric.*, 45, 3, pp. 234–237, 3 pl. (2 col.), 1956.

The author notes the distribution of mal secco (*Deuterophoma tracheiphila*) [36, pp. 242, 400] of citrus in the Mediterranean area and foresees serious damage to lemon in California should this disease ever become established. Californian varieties tested in Sicily were found susceptible [cf. 32, p. 125]. There follows a description of the symptoms of the disease, a brief account of the fungus, and a note of recommended control measures [cf. 33, p. 227].

Brown rot of Citrus.—*Agric. Gaz. N.S.W.*, 67, 11, pp. 579–580, 3 figs., 1956.

Most of this information on *Phytophthora citrophthora*, causing collar rot and brown fruit rot of citrus in New South Wales, has already been noticed [34, p. 707]. *P. hibernalis* [19, p. 326] is occasionally found inducing an identical fruit rot but more leaf damage. Spraying in early April [loc. cit.] with Bordeaux mixture (3–3–100) plus $\frac{1}{2}$ or $\frac{1}{4}$ gal. white oil [see next abstract] gives good protection.

Melanose of Citrus.—*Agric. Gaz. N.S.W.*, 67, 11, pp. 580–583, 5 figs., 1956.

The wet seasons in coastal New South Wales since 1949 have increased the incidence of citrus melanose (*Diaporthe citri*) [36, p. 98], especially in older trees. The spray programme against black spot [*Guignardia citricarpa*: cf. 32, p. 430] gives good control of *D. citri* on Valencia oranges. On Washington navel and Seville oranges Bordeaux mixture (3–3–80) plus $\frac{1}{2}$ gal. white oil [see preceding abstract] should be sprayed at petal fall, a second application being made after six weeks if there is much dead wood. The mixture at 6–6–80–$\frac{1}{2}$ should be applied to lemon and grapefruit when half the petals have fallen.

Leggo (D.). **Mould wastage in Citrus—prompt treatment is essential for best control.**—*Agric. Gaz. N.S.W.*, 68, 2, pp. 89–90, 1 fig., 1957.

At the Gosford Citrus Wastage Research Laboratory, New South Wales, the best control of green mould (*Penicillium digitatum*) on citrus was obtained when the fruit was dipped in sodium *o*-phenyl phenate as soon as possible after picking [34, p. 783]. Valencia oranges harvested in January developed 25 per cent. mould unless treated within $1\frac{1}{2}$ days, and Washington navel oranges picked in July became more than 10 per cent. infected if treatment was delayed for more than four days. Washington navels picked in September showed little breakdown if treated within 3 days.

Andrade (A. C.). **Observações sôbre as Laranjas brasileiras no mercado inglês.** [Observations on Brazilian Oranges in the English market.]—*Biológico*, 22, 11, pp. 187–193, 1956.

Stem-end rot (*Diaporthe citri*) [cf. 33, p. 479] and *Penicillium* rot are the chief causes of transit wastage in cargoes of oranges from Brazil to the United Kingdom. Shirlan plus 2-4D (both at 0·5 per cent.) has proved most effective for control of *D. citri* on Hamlin oranges in transit. The incidence of *Penicillium* sp., which was between 15 and 25 per cent. on cargoes arriving in England in June, 1956, seems to be due mainly to harvesting over-ripe fruit after periods of heavy rainfall.

Calavan (E. C.). **Citrus canker—a bacterial disease caused by Xanthomonas citri.**—*Bull. Calif. Dep. Agric.*, 45, 4, pp. 259–262, 5 figs. (2 col.), 1956.

The author discusses the symptoms, host range and varietal susceptibility, causal organism, diagnosis, survival, history, geographical distribution [map 11], eradication, and control of citrus canker (*Xanthomonas citri*) [35, p. 284]. The disease has not been observed in California and it is presumed that it has been eradicated from other citrus areas in the United States.

Chapot (H.). **Une nouvelle maladie à virus des Agrumes dans le Moyen-Orient.** [A new virus disease of Citrus in the Middle East.]—*Fruits d'Outre mer*, 12, 1, pp. 3–7, 2 figs., 1957.

The gist of the information contained in this paper on stubborn disease of citrus has already been noticed from another source [36, p. 400]. Stubborn disease is regarded as synonymous with 'crazy top', 'acorn' disease [cf. 30, p. 104], 'bluenose' [loc. cit.] of grapefruit, and 'pink nose' [loc. cit.] of oranges.

Wilkins (V. E.). **Report of the working party on tristeza and xyloporosis (Portici, May 14–16, 1956).**—27 pp., 1 col. pl., Paris, 142 Avenue des Champs-Élysées, 1956. [With French version.]

This interesting report consists of general observations, a series of recommendations, and a summary of the present data on citrus tristeza and xyloporosis viruses [36, p. 23], and an extensive bibliography. The following are among the recommended measures for checking the spread of these diseases in the Mediterranean area [cf. 36, p. 100]: establishment of standardized graft-indexing programmes for tristeza and determination of the reaction of local stock and scion combinations to xyloporosis; supervision of commercial orchards and destruction of all tristeza-infected and neighbouring trees; introduction of stringent regulations governing the importation of citrus material; and a visit to the area by a mission with members versed in the diseases to initiate the programme recommended.

The main differences between the diseases [cf. 36, p. 317] seem to be as follows: tristeza, but not xyloporosis, produces vein-clearing on the leaves of certain types of lime; tristeza affects sweet orange on sour orange rootstocks but xyloporosis-affected trees recover when inarched with sour orange rootstocks (although some types of sour orange are susceptible to xyloporosis); xyloporosis-infected sweet orange buds have not produced tristeza when grafted to sour orange in America. By analogy with the virus disease of the same name in America, xyloporosis in the Mediterranean basin is considered to be similar, but its virus nature there has yet to be proved.

Tarr (S. A. J.). **Recent observations on diseases of Cotton in the Sudan Gezira.**—*F.A.O. Pl. Prot. Bull.*, 5, 6, pp. 85–88, 2 figs., 1957.

In 1953–4 a severe outbreak of cotton leaf curl virus [35, p. 423] occurred throughout nearly 120,000 acres of susceptible Sakel cotton growing in the northern half of the Gezira, Republic of the Sudan. Scattered infections were seen in September, though the disease does not usually appear until November–December, and the outbreak spread swiftly. While some fields suffered 30 to 40 per cent. loss, reduction for the Sakel area as a whole was conservatively estimated at 10 to 15 per cent., or 15,000 bales. Infection almost certainly came from illicit out-of-season cultivation of okra (*Hibiscus esculentus*), which has now been stopped.

In 1954–5 blackarm (*Xanthomonas malvacearum*) [36, pp. 185, 244] was widespread throughout the southern Gezira and very severe in the central Gezira, losses being the heaviest for many years. In some fields in the Darwish area planted with X1730A there was an 80 per cent. loss, this area of some 3,800 acres yielding only 3·67 k.p.f. (Alexandrian kantars of seed cotton per feddan), as compared with 4·46 k.p.f. for the adjacent Kumor area (usually yielding less) sown with a blackarm-resistant strain of X1730A cotton (X1730LI), which was only slightly infected. Crop loss from blackarm in the Darwish area probably approached one k.p.f. and for the whole Gezira area probably exceeded 10,000 bales. This exceptionally severe outbreak was due to heavy rainfall after sowing, coupled with infection from diseased material dropped during illegal transfer to villages [35, p. 423]. As a result of phytosanitary measures, strict enforcement of the regulations, and the use of resistant cotton, the succeeding crop (1955–6) was only lightly attacked.

A wilt, the nature of which is not yet understood, was widespread in parts of north-western and west-central Gezira in 1955–6 and appeared to cause a considerable loss of crop.

Seedling stem canker (*Macrophomina phaseoli*) [36, p. 101] was very prevalent in the wet years 1954 and 1956, but negligible in the relatively dry 1955–6 season.

Perithecia of *Leveillula taurica* [36, p. 319] were recently found for the first time in the Republic of the Sudan on safflower near Gedaref and in the Gash delta. Other local hosts [loc. cit.] are caraway and the weeds *Withania somnifera* and *Sesbania* sp.

Sowell (W. F.), Rouse (R. D.), & Wear (J. I.). **Copper toxicity of the Cotton plant in solution cultures.**—*Agron. J.*, 49, 4, pp. 206–207, 1 fig., 1957.

At the Department of Agronomy and Soils, Alabama Polytechnic Institute, Auburn, cotton plants growing in a culture solution containing 0·8 p.p.m. or more copper developed a dark discoloration of the roots and a loss of turgidity in the aerial parts. A concentration of 0·4 p.p.m. or less was not injurious. Analyses showed that copper had accumulated in the tips and middle part of the roots; it was not readily translocated to the leaves.

Masera (E.). **Metarrhizium anisopliae (Metchnikoff) Sorokin, parassita del Baco da seta.** [*Metarrhizium anisopliae* (Metchnikoff) Sorokin, a parasite of the Silkworm.]—*Ann. Sper. agr.*, N.S. 11, 1, pp. 281–295, 4 pl., 1957. [English summary.]

A study of the pathogenicity and cultural and biochemical characters of *Metarrhizium anisopliae* [11, p. 782; 25, p. 161; 34, p. 723, *et passim*], found naturally infecting a silkworm at the Experimental Silkworm Station, Padua, Italy, in 1955, showed that the fungus was pathogenic when fed or inoculated to silkworms but not by contact. It was also pathogenic to *Tenebrio molitor*, *Galleria mellonella*, and *Saturnia pyri*, though harmless to *Dermestes lardarius*.

Infective activity was found to be related to the age of the conidia, which rapidly lose their virulence and viability; under laboratory conditions and temperatures virulence usually ceased after four months. High temperatures (25° to 29° C.) played an important part in infection by accelerating the pathogenic processes, whereas humidity had no marked effect. The fungus is strictly aerobic and is able to grow on all common soils at pH 2 to 10. It is rich in carbohydrase and produces protease and lipase.

Basu (S. N.) & Bose (R. C.). **An anti-fungal substance in Jute.**—*J. sci. ind. Res.*, 15 C, 7, pp. 163–166, 1956.

The results of further studies at the Indian Jute Mills Association Research Institute, Calcutta, indicated that the marked susceptibility of alkali-treated jute to mould infection [32, p. 94], notably by *Trichoderma viride* and *Penicillium variabile*, is due, at any rate in part, to the removal by the process of an antifungal factor or factors present in the plant. This factor was shown to be an organic substance, dialysable, insoluble in dilute hydrochloric acid, and without inhibitory effects on bacteria.

Kurmeleva (Mme N. F.) & Ostapenko (E. Z.). Грибные болезни декоративных деревьев и кустарников в городах Донбасса. [Fungus diseases of ornamental trees and shrubs in cities of the Donets Coalfield.]—Бюлл. бот. Сада [*Bull. bot. Gdn, Moscow*], *1957*, 27, pp. 96–98, 1957.

A disease survey was carried out in 1953 and 1954 of the ornamental trees and shrubs in the cities of the Donets Coalfield, U.S.S.R. The diseases found on the foliage and on the branches and stems are listed. Species resistant to diseases are recommended for cultivation in the area.

Diseases of Azalea.—*Agric. Gaz. N.S.W.*, 67, 11, pp. 583–584, 2 figs., 1956.

The most destructive disease of azalea [*Rhododendron*] in New South Wales is chlorosis due to iron deficiency. No lime or superphosphate fertilizer should be applied. Where symptoms have developed soil applications of iron sulphate or aluminium sulphate at 4 oz. per sq. yd. every three months or monthly foliage sprays of 1½ to 2 oz. iron sulphate in 10 gals. water are effective. Phytosanitary measures and zineb sprays are recommended against *Exobasidium vaccinii*, to which not all varieties are susceptible. Zineb is also effective against *Septoria azaleae* [21, p. 122]. Satisfactory control of *Phytophthora cinnamoni* [35, p. 3] is secured only by growing in well-drained soils.

Dye (D. W.). **Oleander knot (Pseudomonas savastanoi (Erw. F. Smith) Stevens).**—*N.Z. J. Sci. Tech.*, Sect. A, 38, 4, pp. 407–411, 4 figs., 1956.

Pseudomonas savastanoi is recorded for the first time in New Zealand causing oleander knot. It also caused galls when inoculated into olive stems. The pathogenicity, morphology, and cultural and physiological reactions of the bacterium are similar to those described for *P.s.* var. [f. sp.] *nerii* and *P. tonelliana* [36, p. 247] and the author concludes that *P. savastanoi* is the correct name for the oleander pathogen.

Fergus (C. L.). **Myrothecium roridum on Gardenia.**—*Mycologia*, 49, 1, pp. 124–127, 2 figs., 1957.

In the summer of 1952 gardenias growing in several greenhouses in south-eastern Pennsylvania developed a leaf spot caused by *Myrothecium roridum* [26, p. 492]. In culture on malt extract agar the fungus grew well at pH values ranging from 4·8 to 10·6, 90 per cent. or more of the spores germinating; at pH 3·6 growth was poor and germination less than 1 per cent.; no germination or growth occurred at pH 2·7. Colony diameter reached a maximum at 30° C. and dry weight at 25°; at 25° and 30° spore germination was 95 per cent., and at 6° under 1. Experimental inoculations of gardenia leaves gave positive results only when the leaves had previously been wounded.

Hollings (M.). **Pelargonium ring spot.**—*Plant Path.*, 6, 1, pp. 17–18, 1 pl., 1957.

Pelargonium peltatum plants from different localities growing in an insect-proof glasshouse at the Plant Pathology Laboratory, Harpenden, developed yellowish spots, rings, and broken circular markings on the younger leaves in early spring. The symptoms became progressively more conspicuous until the middle of July, after which they faded on the older leaves, the young ones developing few or no markings during late summer and autumn; intensity of symptom expression depended on rapidity of growth. All *P. peltatum* plants examined in many areas bore ring spot symptoms in summer; the condition is not accompanied by an obvious lack of vigour, though occasionally the petals are irregularly inserted and may bear curled enations.

Scions from *P. peltatum* plants with ring spot symptoms were grafted in May, 1953, to four cuttings each of nine *P. zonale* seedlings. After 10 to 12 months yellowish spots and rings appeared on the plants of two lines of the seedlings and indefinite chlorotic spots on some leaves of the other lines. Uninfected control plants of all lines failed to develop such markings. The symptoms on the two affected clones faded away during the summer and reappeared in the following spring. No transmission was obtained with *Myzus persicae* or by mechanical inoculation, but the available evidence strongly suggests that the disease is caused by a virus.

Alcorn (S. M.) & Ark (P. A.). **Movement of certain antibiotics in cuttings of Pyracantha and Carnation.**—*Appl. Microbiol.*, 4, 3, pp. 126–130, 1956.

At the Department of Plant Pathology, University of California, Berkeley, the

bases of *Pyracantha angustifolia* cuttings were dipped in solutions of various antibiotics, washed, and needle-inoculated at the tip with *Erwinia amylovora* [35, p. 114]. The extent of infection indicated that chlortetracycline, oxytetracycline, and tetracycline in effective concentrations moved acropetally more rapidly than streptomycin. Detected by bioassays of stem sections with the same test organism, tetracycline moved more rapidly than neomycin and streptomycin. The same relationship was true of tetracycline and streptomycin in carnation cuttings. The apparent rate of movement of streptomycin in carnation cuttings was increased by the addition of 1 per cent. dipotassium phosphate.

Streptomycin was more detrimental to rooting of carnation cuttings than tetracycline, but rooting was improved by the addition of indoleacetic acid or, less effectively, manganese chloride to either antibiotic. Bioactivity in the cuttings persisted for up to 33 days after treatment with streptomycin, but diminished by at least the third week with tetracycline.

Graham (D. C.). **Chrysanthemum flower distortion disease in south-east Scotland.** —*Plant Path.*, 6, 1, pp. 15–17, 1957.

A survey for chrysanthemum flower distortion virus disease [cf. 35, p. 299] made during the period September–December in 1953 and 1954 by the East of Scotland College of Agriculture, Edinburgh, in the course of which 23 nurseries were visited in East, Mid-, and West Lothian, Perth, and Angus, indicated that the disease is extensively distributed throughout chrysanthemum stocks, particularly early varieties. Only 33·3 per cent. of such stocks examined in 1953 and 31·1 in 1954 were without virus symptoms, though of the late-flowering stocks 75·9 and 80·3 per cent., respectively, appeared to be healthy. Possibly, the more remunerative later varieties receive more spraying and roguing than do the earlier ones.

Palti (J.) & Nitzany (F.). **The principal diseases of Lucerne.**—*ex* Lucerne Growing in Israel, 4 pp., 4 figs., Tel-Aviv, Field Crop Growers' Association, 1957. [Hebrew, authors' summary.]

The symptoms and distribution of the diseases most commonly found on lucerne in Israel are described and control measures are briefly indicated.

Rust (*Uromyces striatus*) occurs all over the country, the first symptoms generally appearing in the fourth week after cutting, though little damage is done up to the fifth or sixth week. The disease therefore causes no losses in summer when the crop is cut once every three or four weeks, but may be harmful in winter, when the interval lengthens to five to seven weeks. Seed crops are particularly vulnerable; control measures are advocated only on these crops.

Downy mildew (*Peronospora aestivalis*) [*P. trifoliorum*] occurs chiefly in the coastal belt, the western Negeb, and the Huleh Valley. This is the only harmful leaf disease during the first weeks after seeding or cutting. Frequent overhead irrigations of newly-sown crops favour it, though it is rarely severe enough to warrant the expense of spraying.

Powdery mildew (*Oidiopsis* sp.) [cf. 26, p. 532 and following abstracts] occurs only in the oidial stage and is common in the Jordan and Huleh Valleys, but does not occur in the coastal belt. Only crops cut at intervals of at least four to five weeks show mildew symptoms. Seed crops suffer little damage because they are grown in summer when the disease is rare.

Pseudopeziza blight (*Pseudopeziza* sp.) is present chiefly in the coastal belt and adjoining regions in late winter and spring. Heavy defoliation results, but no control measures have so far been worked out.

The principal leaf spot agent is probably a species of *Ascochyta*; it causes severe losses all over the country, especially in winter. Pending detailed studies, no control measures can at present be recommended.

Anthracnose (*Colletotrichum* sp.) is found all over the country, but not on berseem clover [*Trifolium alexandrinum*]. Losses have so far been light, but the disease appears to increase in intensity from year to year.

Palti (J.) & Stettiner (M.). **The principal pests and diseases affecting legume crops in spring.**—*Adv. Leafl. agric. Consultants* 20, 15 pp., 7 figs., 1957. [Hebrew, authors' summary.]

The following diseases occur in Israel during the spring season. Various species of *Uromyces* affect practically all legumes grown all over the country. The broad bean crop suffers the most [from *U. fabae*], while berseem clover and lucerne [*U. striatus*] incur losses only when grown for seed or where the crops are cut at unduly long intervals. Peas [*U. pisi*] and fenugreek [? *Uromyces*: see next abstract] crops grown for seed may also be severely affected. Purple vetch [*U. fabae*] and lentils [*U. lentincola*: cf. 33, p. 448] rarely suffer much. Chemical control measures are seldom employed, except on broad bean crops grown for pods.

Powdery mildew [*Erysiphe polygoni*] affects peas, purple vetch, and berseem clover all over the country. This and *Oidiopsis* [see preceding and next abstract] develop profusely only on plants approaching maturity; marked losses are caused to peas grown for pods or seeds and vetches grown for seed, but losses are rare on clover. Sulphur dusting from ground equipment or aircraft gives effective control. Species of *Peronospora* appear in the early stages of growth on peas [*P. viciae*] and may cause moderate to severe damage. Purple vetch and berseem clover are less affected [*P. trifoliorum*]. All downy mildews are particularly common in the coastal belt and adjoining districts.

Chocolate spot (*Botrytis fabae*) on broad beans causes heavy losses all over the country.

Species of *Ascochyta* and *Cercospora* cause blights on a number of legumes. For example, very severe damage is caused by an *Ascochyta* sp. on purple vetch and by another on peas; seed crops in particular suffer.

Palti (J.). **Parasites of Fenugreek.**—*Hassadeh*, 37, 3, pp. 232–233, 1956. [Hebrew, author's summary.]

Fenugreek (*Trigonella foenum-graecum*), grown in Israel for green manure and seeds, is attacked by downy mildew (*Peronospora* sp.) [cf. 33, p. 708] which is widespread and may appear on the leaves during the first month of growth. Oospores have been found in one instance. An unidentified rust [? *Uromyces* sp.: cf. 34, p. 373 and preceding abstract] present on the leaves from March to June is harmful only to seed crops. A rust on related wild species of *Trigonella* has been identified as *Uromyces anthyllidis* f. *trigonella*. A powdery mildew of the *Oidiopsis* type [see preceding abstracts] is common on leaves, stems, and pods all over the country and is of economic importance on seed crops.

Of the leaf spots appearing on fenugreek, *Cercosporina trigonella* [*Cercospora traversiana*: cf. 34, p. 432] has been identified by Rayss (private communication). It affects pods and may also be seed-borne.

Weltzien (H. C.). **Untersuchungen über das Vorkommen der Luzernevertizilliose und weiterer Luzerneerkrankungen in Südwestdeutschland.** [Studies on the occurrence of verticilliosis and other diseases of Lucerne in south-west Germany.]—*NachrBl. dtsch. PflSchDienst* (*Braunschweig*), *Stuttgart*, 9, 3, pp. 42–45, 3 figs., 1957.

From the Plant Protection Institute, Stuttgart-Hohenheim, Germany, the author reports on disease in material collected at random from lucerne crops in Baden-Württemberg and Pfalz, Germany, and Thurgau, Switzerland.

In 47 (82 per cent.) of the samples *Verticillium albo-atrum* [17, p. 754] was res-

ponsible for the diseased condition. In 16 of 47 affected crops, individual affected plants were so scattered that assessment of incidence was impossible. In the remaining 31 incidence was assessed at between 5 and 100 per cent., averaging 50 per cent.

A *Colletotrichum* sp., probably *C. trifolii* [13, p. 382], was present in 29 out of the 56 samples; a *Phoma* sp., identical with the fungus described as *Ascochyta imperfecta* by Braun & Kröber [33, p. 486], more recently considered to be *P. herbarum* var. *medicaginis* [35, p. 828], was present in 24.

Identification of *Verticillium* infection is possible in the field, though, contrary to the experience of Richter and Klinkowski [17, p. 754], symptoms appeared at a stage when healthy shoots had reached an average of 30 cm., rather than shortly before flowering. In one type of infection the shoots make poor growth and exhibit marked shortening of the internodes; the leaves, particularly the upper ones, are mostly small and narrow, remain folded about the midrib, point somewhat stiffly upwards, and usually dry out from the tips and die. A second type of symptom is observed in which the green leaves unfold normally and then curl upwards and inwards in a slightly spiral fashion, after which they wither and fall. There is also a third, frequently seen, in which the lower leaves in particular turn yellow and fall. Later, conidial fructifications form on the dead stems, giving a powdery, greyish-white appearance.

All the symptoms were observed in artificial infections, in which, however, more rapid progress of the disease was associated at the outset with a wilting not yet observed in the field.

The authors conclude that *Verticillium* infection has been at least an essential factor in the markedly diseased condition of lucerne at Tauberbischofsheim, Buchen, Bad Mergentheim, and Künzelsau over the period 1954 to 1956, which has caused almost total loss of the seed crop. The progressive build-up of infection there has now made it uneconomic to maintain a lucerne crop for more than three years.

Bom (G. J.) & Postma (G.). **Mangaangebrek bij Rode Klaver en Luzerne.** [Manganese deficiency in Red Clover and Lucerne.]—*Landbouwvoorlichting*, 14, 4, pp. 176–179, 1 fig., 1957.

Among other crops, e.g., beets and peas, on young clay soils with a heavy admixture of lime on islands in the Netherlands, red clover and lucerne are reported to develop symptoms of manganese deficiency every year. In clover stands the effects of the shortage, in the form of a pale green to bronze-yellow coloration, were already apparent at the time of the first cut, but in lucerne they do not become noticeable until the second. Spraying with manganese sulphate restored the normal green colour and increased yields substantially over those of the treated plots. In the case of lucerne, one application before the first cut exerted no influence on the second.

Fitzpatrick (E. N.). **Molybdenum for subterranean Clover.**—*J. Dep. Agric. W. Aust.*, Ser. 3, 6, 1, pp. 65–68, 3 col. figs., 1957.

In further experiments conducted in the Bridgetown, Balingup, Donnybrook, and Nannup districts of Western Australia, an application of molybdenum trioxide at the rate of 2 oz. per acre completely overcame the effects of molybdenum deficiency [cf. 29, p. 623] in subterranean clover [*Trifolium subterraneum*]. The symptoms of the condition are described and the effects of the treatment figured in colour.

Gough (F. J.) & Elliott (E. S.). **Blackpatch of Red Clover and other legumes caused by Rhizoctonia leguminicola sp. nov.**—*Bull. W. Va agric. Exp. Sta.* 387 T, 23 pp., 11 figs., 1956. [Received March, 1957.]

The causal agent of the black patch disease of clover [33, p. 32] and other

leguminous hosts [cf. 30, p. 210], including *Medicago lupulina* and *Lespedeza stipulacea*, which has continued to be destructive on the red clover seed crop in West Virginia [31, p. 18], has been named *Rhizoctonia leguminicola* n. sp. and is described. Sclerotia developed at an optimum initial pH between 5·9 and 7·5 when asparagine, peptone, DL-beta-phenylalanine, and potassium nitrate were added to a glucose agar medium, production being most active with asparagine at a concentration of 0·05 per cent., and numerous sclerotia formed when D-glucose, D-mannose, D-fructose, maltose, and sucrose were used as single carbon sources.

Bioquin 1 gave good control of *R. leguminicola* in the greenhouse, and orthocide 406 and parzate were also effective, but no treatments proved successful in the field and control must depend on the discovery of resistant individuals.

Quantz (L.) & Brandes (J.). **Untersuchungen über ein Steinkleevirus.** [Studies on a Sweet Clover virus.]—*NachrBl. dtsch. PflSchDienst* (*Braunschweig*), *Stuttgart*, **9**, 1, pp. 6–10, 5 figs., 1957.

The authors describe a virus, referred to as sweet clover virus, which was obtained, together with bean yellow mosaic virus, from a mixed infection of a single plant of sweet clover (*Melilotus alba*) [34, p. 8] at Giessen, Hessen, Germany.

Symptoms on naturally infected sweet clover consisted of a clearing of the lateral veins, some of which turned brown and necrotic, and scattered intervenal desiccation. Experimental infection sometimes caused indistinct greenish-violet ring-spotting followed by early yellowing and premature abscission. Later the plants exhibited a chlorotic spotting of the veins, producing indistinct linear patterns, and light brown intervenal necrosis. On broad bean inoculation by abrasion produced violet brown, confluent necrotic patches about two mm. in diameter after six to eight days and affected leaves soon blackened and died. The subsequent systemic infection progressed from leaf discoloration and wilt to general necrosis. In most varieties of pea such infection was symptomless, though there was transient wilting and grey-green discoloration of the inoculated leaves and adjacent younger leaves. In Onward and Grosshülsige Schnabel, however, there was transient vein-clearing or very slight mosaic. The symptoms produced in a number of other legumes are tabulated.

The thermal inactivation point in expressed sap over ten minutes was between 68° and 70° C., and the dilution end-point between 1:100,000 and 1:1,000,000. *In vitro* at room temperature infectivity was retained for 24 hours, but lost after 48. In preparations from sweet clover, broad bean, and pea the virus particles were straight or slightly bent rods mostly between 500 and 700 mμ in length. The virus is therefore distinct from *Phaseolus* virus 2 [bean yellow mosaic virus: cf. 35, p. 260] and is considered to be related to the pea streak group (pea streak virus [cf. 31, p. 276] and Wisconsin pea streak virus [cf. 35, p. 63]), of which this would be the first report in Europe.

Ergot of Paspalum.—*Agric. Gaz. N.S.W.*, 68, 2, pp. 92–93, 1 fig., 1957.

Paspalum ergot (*Claviceps paspali*) occurs in New South Wales on *P. dilatatum* [33, p. 727; cf. 34, p. 95], *P. distichum* [cf. 21, p. 22], and *P. urvillei* [15, p. 724]. It has become widespread in urban parks and playgrounds. *C. paspali* can be attacked at the honey dew stage by *Cerebella* sp. [cf. 33, p. 539] and *Fusarium* sp. [loc. cit.].

Gavrilović (M.). **Nedostatak cinka kod raznih vrsta i sorata voćaka u NR Srbiji i prihranjivanje voćaka cinkom.** [Zinc deficiency in different species and varieties of fruit in the P.R. of Serbia and treating fruit trees with zinc.]—*Arh. poljopr. Nauk* [*Trans. Inst. Agron. Res.*], 9, 24, pp. 107–116, 5 figs., 1956. [English summary.]

A survey of zinc deficiency in fruit trees, carried out by the Institute for Fruit

Growing, Čačak, Yugoslavia, from 1952 to 1955, revealed this to be most pronounced in trees growing in alluvial-sandy soils in Serbia and Metohija and in the black soil of Vojvodina. Symptoms were most severe on apple and cherry trees and less so on peach, plum, and quince. Some ornamental plants were also affected.

Of the apple varieties examined, Šumatovka, Kolačara, Ontario, and Jonathan were the most resistant. Warm dry weather, especially in the spring, and also in the summer, emphasizes the symptoms. Biennial dormant sprays of zinc sulphate (3 to 4 kg. per 100 l. water) applied to affected stems correct the disorder satisfactorily; zinc oxide was less effective.

Beyers (E.). **Trace element nutrition in deciduous orchards and vineyards.**—*Fmg in S. Afr.*, 32, 3, pp. 33–38, 41, 8 figs., 1956.

Spraying programmes for control of zinc, manganese, copper, iron, and magnesium deficiencies of fruit trees and grape vines in South Africa are discussed in the light of studies carried out at the Western Province Fruit Research Station since 1951, and concentrations applicable at different stages of growth are tabulated for each deficiency.

On fruit trees nutritional sprays applied in the spring during the first four weeks of growth gave the best results. When zinc and manganese deficiency symptoms (the most widespread) occur, annual treatment should comprise two sprays at a four-week interval in the August to November period.

Michiels (A.) & Semal (J.). **La moniliose des arbres fruitiers.** [Moniliasis of fruit trees.]—*C. R. Inst. Rech. sci. Ind. Agric.* 15, 56 pp., 24 figs., 1 graph, 1955.

This publication presents the results of studies on brown rot of fruit trees conducted during the past few years at the La Roncière Research Centre, La Hulpe, Belgium [cf. 26, p. 304]. Wormald's bulletin [34, p. 793] is frequently cited. There are four sections, dealing respectively with the mycological, ecological, and phytopathological characteristics of *Sclerotinia fructigena* and *S. laxa*, and with control; there is a bibliography of 30 titles.

Michiels (A.) & Semal (J.). **Action de quelques fongicides organiques sur les fruits.** [Effect of certain organic fungicides on fruit.]—*Meded. LandbHoogesch. Gent*, 20, 3, pp. 527–534, 1955. [Received December, 1956.]

In fungicide trials at the La Roncière Research Centre, Belgium, in 1954, only thiram was effective against mildew [*Podosphaera leucotricha*: 31, p. 243] on apple leaves. Captan at 0·5 to 0·25 per cent. gave the best control of scab [*Venturia inaequalis*: 34, p. 600]. Rugosity was diminished by captan and, to a lesser extent, by thiram, but increased by ziram, zineb, and, above all, by glyodin.

Of 14 varieties of cherry sprayed with 0·25 per cent. captan eight days before picking, 11 survived better in storage than the control; captan-treated apples and pears were similarly protected.

Mallach (N.). **Auftreten und Verbreitung von Viruskrankheiten in zwei Obstbaugebieten Bayerns.** [Occurrence and distribution of virus diseases in two fruit-growing districts of Bavaria.]—*Pflanzenschutz*, 9, 1, pp. 8–12, 10 figs., 1 diag., 1957.

During the period from August to October, 1956, more than 120,000 fruit trees were examined for symptoms of virus infection in the Bodensee and Volkach districts of Bavaria. In the former, where pome fruits (mostly apple) predominate, apple mosaic [35, p. 683] and witches' broom [cf. 35, p. 775] are the principal viroses, while band mosaic [? plum line-pattern virus: 36, p. 330] is the most prevalent in the latter, occupied almost exclusively by various types of plum; in both areas the percentages of trees affected by apple mosaic and the plum virus were roughly

1 and 3·5, respectively. The author has shown (*Prakt. Bl. PflBau*, 51, pp. 255 *et seq.*, 1956) that yield reductions from apple mosaic over a nine-year period averaged 55·34 per cent. The latter virosis appears to affect principally the Beauty of Boskoop, Cox's Orange Pippin, and Golden Pearmain varieties, while witches' broom is most prevalent on Boskoop and Champagne Pippin. Susceptibility to band mosaic was observed mainly among early plum varieties, e.g., Bühler and Ersinger, the late-ripening Czar, Ontario, Victoria, and others being apparently immune. Unfamiliar symptoms on Bühler and Lützelsachser plum leaves in two orchards in the Volkach district (involving 22 out of 40 trees in one) consisted of yellowish-white spots, sometimes dispersing like clouds at the margins. The material was submitted for examination to Posnette, who attributed the lesions to apple mosaic virus.

A sectorial chlorosis and enation of Zimmers Early and domestic plum leaves, is presumably identical with the so-called 'following disease' on May cherries from the Netherlands (*Tuinbouwgids*, 1955) [35, p. 374] and the Heidelberg region of Germany, which owes its name to the belated maturity of the fruit. It is not yet known whether the condition is of genetic or virus origin, but the author inclines to the former view. It is further uncertain whether a widespread vein-clearing of Cox's Orange Pippin apple foliage, which has also been observed in Württemberg and Heidelberg, is caused by the rough skin virus [loc. cit.]. Yet another condition of obscure origin is 'keel leaf' or 'boat formation' in the Boskoop, Cox's Orange, and Strawberry apple varieties, characterized by definite folds and the development of sharp edges along the midrib and often also along the lateral veins.

The presence of flat limb virus of apples [loc. cit.] has not yet been demonstrated with certainty in either of the areas inspected, but closely similar symptoms were conspicuous round the Bodensee on the shoots of Champagne and Cox's Orange Pippin and Golden Pearmain. Attention is drawn to various other suspected viroses of fruit trees and wild plants, the latter including symptoms reminiscent of band mosaic on sloes and elder, and a yellow mosaic of *Aristolochia clematitis*. In conclusion, the practical applications of the knowledge acquired from the foregoing investigations are briefly considered.

Wagnon (H. K.) & Breece (J. R.). **Peach calico, one of many virus diseases of stone fruits.**—*Bull. Calif. Dep. Agric.*, 45, 4, pp. 256–258, 2 figs. (1 col.), 1956.

The authors discuss the symptoms of peach calico virus in California [34, p. 85], Idaho, and Washington. The disease has been reported on the Rochester, Early Crawford, Elberta, J. H. Hale, Rio Oso Gem, and Gaume varieties, on S-37 peach seedlings, and on the Early Le Grande variety of nectarine. All peach and nectarine varieties are believed to be susceptible. Attempts to infect cherry, apricot, and Italian prune have been unsuccessful. Erratic development of symptoms on different trees suggests the existence of more than one strain. Control consists primarily in avoiding propagation from infected trees, the only known method of spread.

Dye (M. H.). **Studies on the uptake and translocation of streptomycin by Peach seedlings.**—*Ann. appl. Biol.*, 44, 4, pp. 567–575, 1 pl., 4 graphs, 1956.

In further work at the Department of Scientific and Industrial Research, Auckland, New Zealand, Golden Queen peach seedlings were grown to a height of 12 to 24 in. in a glasshouse, the soil removed by washing, and the roots placed in mineral nutrient solutions containing streptomycin at 10, 25, and 50 μg. per ml. [cf. 36, p. 36]. Observations showed that streptomycin passed into the foliage, where it sometimes reached concentrations higher than those of the solutions surrounding the roots. The amount of streptomycin present in the leaves varied with the time the roots remained in the solutions and with the concentration of streptomycin used. Antibiotic activity (assayed by the paper-disk-plate method against *Bacillus*

subtilis) could be detected in the foliage of seedlings, the roots of which were placed in solutions containing only 10 μg. per ml. streptomycin. Damage to the roots in transfer to the solutions probably increased the rate of streptomycin intake. In all the plants the concentrations of the antibiotic present in the upper leaves were markedly less than those in the lower leaves [cf. 33, p. 545].

The addition of macerated leaf tissue to streptomycin solutions decreased the amount of streptomycin detectable in the super-natant liquid to a greater extent than could be explained by dilution or alteration of pH. (It was also noted that some unknown constituents in peach tissue promote the growth of *B. subtilis* on agar.)

Streptomycin decreased apical growth, and at the higher concentrations caused the appearance of chlorotic and necrotic areas on leaves and stems.

Crosse (J. E.) & Bennett (Margery). **Preliminary field trials with streptomycin for the control of bacterial canker of Cherry.**—*Plant Path.*, 6, 1, pp. 31–35, 1 fig. (between pp. 18 and 19), 1957.

Since Bordeaux mixture used for bacterial canker of cherry (*Pseudomonas mors-prunorum*) [24, p. 323; 36, p. 252] tends to be phytotoxic and is deleterious to spray machinery, field trials were conducted from 1954 to 1956 inclusive at East Malling Research Station, Kent, to assess the value of spring and autumn streptomycin sprays as an alternative. In 1954 two applications of streptomycin sulphate (200 p.p.m.) were made to four-year-old cherry trees on 23rd September. In 1955 these trees were sprayed on 2nd September and 4th October with streptomycin hydrochloride (220 i. u. per ml.), the same treatment having been applied three times in May during the blossom period.

The results showed that the autumn sprays of streptomycin (assisted, possibly, by the spring sprays in 1955) reduced the total number of branch infections on the Napoleon variety by over two-thirds and on the more resistant Roundel by slightly over one-half. In the second year's trial there were indications that streptomycin (which proved in no way phytotoxic) was more effective against the milder types of attack than against the more severe forms, such as die-back, but this needs confirmation. Comparisons with earlier trials suggest that the degree of control given by streptomycin is slightly greater than that obtained with two autumn sprays of 10–15–100 Bordeaux mixture. Streptomycin was also highly effective against the leaf spot phase of the disease, against which it appeared to be more effective than Bordeaux mixture, possibly because, unlike the latter, it could be applied during blossoming, as well as before and after.

Lehoczky (J.). **A Meggy glöosporiózisának hazai előfordulása.** [Occurrence of gloeosporiosis of sour Cherry in Hungary.]—*Kertész. Szölész.* (formerly *Agrártud. egy. Évkön.*), 3 (19, *1955*), 2, 15 pp., 7 figs., 1957. [Russian and English summaries.]

Gloeosporium fructigenum [*Glomerella cingulata*: cf. 29, p. 218] was found for the first time on sour cherries in Hungary in July, 1954, in the north-eastern part of the country. Only the fruits were affected, later becoming mummified but never bitter. The fungus penetrates through the pedicel into the twig and overwinters in mummified fruits or in the pedicel. Mechanical cleaning and spraying are advised for the prevention of the disease.

Corke (A. T. K.). **Apparatus for recording the rate of spore discharge.**—*Plant Path.*, 6, 1, pp. 25–26, 1 fig. (between pp. 18 and 19), 1957.

In work at Long Ashton Research Station, Bristol, on the perennation of *Pseudopeziza ribis* [35, p. 201], ascospore discharge from black currant leaves was studied by means of an apparatus in which the ascospores are trapped on agar in a slowly

revolving Petri dish. The apparatus consists essentially of a drum (of a meteorological instrument) revolving inside a metal cylinder, both attached to a wooden base. The open Petri dish is placed on top of the drum, and a glass plate, supported above it by the cylinder, carries the spore source. A rubber ring round the top of the cylinder provides a non-slipping surface for the plate. A disk 1 cm. in diameter is cut from a leaf bearing mature apothecia and is placed upside down on a drop of agar on a mark made 1¼ in. from the centre of the glass plate.

The approximate time required for the apothecia to reach full maturity was determined by the density of the ascospore discharge from leaf disks cut at intervals from wetted overwintered leaves [loc. cit.] incubated in a moist chamber at 72° F. The results showed that the incubation period required became progressively shorter as the season advanced, the apothecia maturing readily in the field during May. Although ascospore discharge was induced prematurely by prolonged incubation, the percentage germination was very low; the number of ascospores discharged and the percentage germination both reached a maximum during May. Under suitable conditions spores were discharged for more than 24 hours, the rate decreasing during darkness and increasing upon the return of daylight. No discharge occurred in continuous darkness.

Wilhelm (S.). **Control of Verticillium wilt of Chrysanthemum and Strawberry by soil fumigation with chloropicrin.**—*Down to Earth*, 12, 2, pp. 12–15, 5 figs., 1956.

Most of the information contained in this paper on control of *Verticillium* wilt (*V. albo-atrum*) of strawberries in California by chloropicrin fumigation has been noticed from another source [36, p. 38]. A fumigation schedule, based on the latest results, is now given. Land should not be planted for two weeks after fumigation and dry, shallowly worked soil should not be treated.

A field planted with Shasta strawberries in February, 1956, showed 0·44 per cent. wilt in July, as against 6·8 for the control plots, in which wilt may probably increase.

Edmonstone-Simmons (Miss C. P.). **Black spot : symptoms and control.**—*Fmg in S. Afr.*, 32, 11, pp. 22–25, 2 figs., 1957.

In studies at Rhodes University, Grahamstown, South Africa, on black spot of pineapple [8, p. 586; 34, p. 533] *Penicillium funiculosum* was isolated in 45 per cent., and *Fusarium moniliforme* [*Gibberella fujikuroi*] in 24 per cent., of the 159 affected areas examined on 454 plants. A mixture of these two fungi was found in 13 per cent. *Thielaviopsis* [*Ceratocystis*] *paradoxa* [loc. cit.], *Phoma* spp., and an unidentified bacterium and yeast, were isolated less frequently. There are two types of black spot: 'wet', in which the affected cells appear softer than the surrounding tissue; and 'dry', in which the diseased tissue is hard and often fissured.

In field experiments to test the pathogenicity of *Penicillium funiculosum*, *G. fujikuroi*, and *P. expansum*, black spot developed wherever the skin of the floral cavity was broken, and regardless of the fungus used. Laboratory tests indicated that 'dry' spots occurred when immature fruit was inoculated and 'wet' if it had matured under humid conditions. Incidence was positively correlated with high rainfall. The primary cause of the injury to the floral cavity, without which infection cannot occur, has yet to be found.

Van Lelyveld (L. J.). **Sun scald—most dreaded enemy.**—*Fmg in S. Afr.*, 32, 10, pp. 28–32, 11 figs., 1957.

Sun scald of pineapples [cf. 34, p. 734], arising from continued exposure of fruit in the afternoon sun to temperatures above 35° C., can be either external or internal, and causes serious damage in South Africa, fruit due to ripen in three to four weeks being chiefly susceptible. With external scald a light, dull yellow (or, in the

case of serious damage, white) colour develops, the affected part gradually becoming a dry brown spot. Internal scald causes hollows in the fruit, and in some varieties fermentation. Control is effected by using shields of various shapes, adjusted for ventilation.

TAYLOR (O. C.), CARDIFF (E. A.), MERSEREAU (J. D.), & MIDDLETON (J. T.). **Smog reduces seedling growth.**—*Calif. Agric.*, 11, 3, pp. 9, 12, 2 figs., 1957.

At the University of California, Riverside, Zutano avocado seedlings in sand culture were treated with a synthetic smog consisting of a mixture of ozone and hexene vapour for a total of 280 hours, seven hours daily, the oxidant concentration of the polluted air being maintained at about 0·17 p.p.m. Some leaf injury [cf. 36, p. 48] was observed after approximately two weeks, bronze or brown spots appearing on the lower surface of some leaves and tip and marginal burn affecting others. Chlorosis increased progressively, new leaves were noticeably dwarfed, and the seedlings were reduced in size.

GEORGHIOU (G. P.). **Olive leaf spot disease (Cycloconium oleaginum Cast.) in Cyprus and its control.**—*Tech. Bull. Dep. Agric. Cyprus* 2, 8 pp., 1956. [Mimeographed.]

Most of this information on olive leaf spot (*Cycloconium oleaginum*) in Cyprus has already been noticed [36, p. 109]. The local variety Ladoelia is far more susceptible than some of the introduced varieties, among which, from limited observations, Morellona, St. Agnes, and Ascolano denera appeared to be immune.

[This paper also appears in *World Crops*, 9, 2, pp. 63–65, 1957.]

Murphy low volume spraying conferences.—Murphy Chemical Company Limited, Wheathampstead, Herts., 70 pp., 1957. [Photolithed.]

This publication contains 14 papers presented at three conferences on low volume spraying held by the Murphy Chemical Company during 1956 for the purpose of surveying various techniques, including air-blast, mist-blow, and concentrate spraying.

J. B. BYASS discusses low volume spraying: theory and experiment; M. H. MOORE deals with the approach to low volume spraying; L. C. PEARCH with low volume spraying and its development in England; G. FLETCHER with the development of the unimist nozzle for low volume spraying; and B. W. J. WULFF with the essential features required in the design of low volume orchard sprayers. G. J. ROSE writes on six years of the rotary atomizer in crop protection; J. ROBERTS on low volume spraying in East Anglia; and L. F. CLIFT on some implications of the introduction of low volume spraying. W. G. KENT discusses what the prospective user asks about low volume spraying; and W. S. ENGLISH writes on low volume spraying in East Sussex, while D. HUNNAM gives a summary of growers' experiences with low volume machines, and N. K. SMITH deals with the toxicology of spray chemicals. The final paper is a summing-up by the chairman of the company, G. L. HEY.

Atti del Convegno sugli anticrittogamici acuprici di Padova tenutosi il giorno 7–11–1955. [Proceedings of the Padua Convention on non-copper fungicides held on 7–11–1955.]—*Notiz. Malatt. Piante, 1956*, 35–36 (N.S. 14–15), pp. 1–181, 8 figs., 9 graphs, 1956.

In a general address to this Convention, C. SIBILIA (pp. 15–25) reviewed and discussed the results obtained in Italy since 1949 on the control of vine downy mildew [*Plasmopara viticola*] and oidium [*Uncinula necator*] by non-copper fungicides [36, p. 302, *et passim*]. B. CASARINI and E. PUCCI (pp. 31–32) described comparative *in vitro* tests at the Istituto di Patologia Vegetale dell' Università, Bologna, of the fungicidal efficacy of aspor (containing zineb) and Caffaro powder against

P. viticola. In experiments (pp. 33–36), in which these materials were applied in the laboratory to Panse precoce vine leaves inoculated with a conidial suspension of the fungus, Caffaro powder prevented germination at 1 in 45,000, but not at 1 in 66,000; the corresponding figures for aspor were 1 in 80,000 and 1 in 110,000. In further work (p. 37) aspor was found to lose its fungicidal efficiency very slowly; when leaves were inoculated 20 days after treatment only 10 to 12 lesions developed for every 100 drops of inoculum, 70 to 80 lesions being present on the untreated controls on the same date.

G. Luchetti and G. Carraro (pp. 39–57) described *in vitro* tests at the Istituto Botanico dell' Università di Ferrara with 44 commercial fungicidal products and adjuvants against *Fusicladium dendriticum* [*Venturia inaequalis*: 35, p. 829]. P. Fontana, A. Canova, and B. Casarini (pp. 59–66) dealt with investigations at the Istituto di Chimica Agraria, Università Cattolica del S. Cuore, Piacenza, and at Bologna, into the biological and fungicidal activity of *s*-triazine derivatives [34, p. 307]. P. Fontana, R. Martelli, and B. Casarini (pp. 67–70) reported studies at the same two centres on the translocation of zineb in vines [35, p. 270], which indicated that the systemic activity of this material is very slight.

G. Goidànich (pp. 71–72) discussed comparative tests in progress at Bologna on the control of *P. viticola* by zineb and copper compounds [35, pp. 270, 658]. M. Ribaldi (pp. 73–77) reported from the Istituto di Patologia Vegetale dell' Università di Perugia that on certain vine varieties and in some damp, low-lying areas, aspor is not an effective substitute for Bordeaux mixture for the control of downy mildew.

S. Foschi and G. Govi (pp. 79–84), working at the Istituto di Patologia Vegetale dell' Università di Bologna and at the Osservatorio fitopatologico, Sezione di Patologia Vegetale, Bologna, reported that good control of *V. inaequalis* on apple was given by all the 15 non-copper and copper- and sulphur-containing products tested in 1955; zineb M 555 and cuprosan gave better results together than separately.

G. Scaramuzzi (pp. 85–90), at the Laboratorio Crittogamico Italiano, Pavia, and at the Istituto di Patologia Vegetale dell' Università di Bari, described tests with various non-copper fungicides against vine downy mildew and other diseases of plants in Apulia. G. Miotto (pp. 91–103), at the Ispettorato Provinciale dell'Agricoltura, Padua, described spraying tests in which 0·9 per cent. thiazine (containing zineb) was as effective as 2 per cent. Bordeaux mixture against peach leaf curl (*Exoascus* [*Taphrina*] *deformans*); when thiazine was used at 0·6 per cent., infection was almost negligible, but at lower concentrations this product failed to give effective control.

A. Canova (pp. 105–108) reported from the Istituto di Patologia Vegetale dell'Università di Bologna that aspor gave only very moderate control of beet leaf spot (*Cercospora beticola*) in the field. D. Picco (pp. 109–111), from the Laboratorio Crittogamico Italiano and the Osservatorio per le malattie delle piante, Pavia, stated that the fungicidal activity of 0·3 per cent. manzate, S.R. 406, tulisan, and zineb, and 1 per cent. Bordeaux mixture against diseases of tomatoes growing near Parma in 1955 was, respectively, 10, 10, 8, 7, and 7 assessed on a scale of 0–10. The fungicidal effects of Bordeaux mixture were more persistent than those of zineb.

G. Borzini (pp. 113–116), reporting from the Laboratorio sperimentale di fitopatologia, Turin, discussed the results of spraying tests carried out in Piedmont against vine downy mildew with colloidal sulphur in combination with non-copper materials containing zineb. R. Ciferri (pp. 117–118), at the Istituto Botanico dell' Università e Laboratorio Crittogamico Italiano, Pavia, expressed the view that vines treated with zineb are seldom more severely affected by *U. necator* than others are. D. Rui and G. Cosolo (pp. 119–124), at the Osservatorio Fitopatologico, Verona, described field tests in which non-copper products contain-

ing zineb or captan gave satisfactory control of *Coryneum beijerinckii* [*Clasterosporium carpophilum*] and *T. deformans* on peach.

P. Alghisi (pp. 125–127) discussed an experiment at the Istituto di Patologia Vegetale, Università di Padova. Treatment of beets with streptomycin (three applications, each at the rate of 600 l. per ha. and at concentrations of both 474 and 120 μgm. per ml. of solution) failed to control infection by *Cercospora* [*beticola*]. C. A. Ghillini and G. Fior (pp. 129–150) described an experiment at the Istituto di Patologia Vegetale, Università di Pavia, in which Embro 155W maize seed was mechanically injured and treated with various dusts before sowing. Injuries near and on the embryo reduced stand and yield; the best results were given by mecurigamma, which increased germinability by 16·21 per cent. and yield by 7·54 per cent. over the untreated controls, the corresponding figures for sesan being 10·79 and 5·35 per cent.

Sibilia (C.). **La sperimentazione con anticrittogamici acuprici in Italia.** [Experiments with non-copper-containing fungicides in Italy.]—*Boll. Staz. Pat. veg., Roma*, Ser. 3, 14 (*1956*), 1, pp. 1–11, 1957.

This address on the results obtained since 1949 at the Plant Pathology Station, Rome, in experiments on the control of vine downy mildew [*Plasmopara viticola*] and oidium [*Uncinula necator*] by non-copper-containing fungicides has already been noticed from another source [see preceding abstract].

Specialpræparater anerkendte af Statens Forsøgsvirksomhed i Plantekultur til bekæmpelse af plantesygdomme og skadedyr. Gyldig for året 1957. [Special preparations approved by the State Experimental Service in Plant Cultivation for the control of plant diseases and pests. Valid for the year 1957.]—*Tidsskr. Planteavl*, 60, 5, pp. 805–841, 1957.

The current list of plant protectives officially authorized for use in Denmark during 1957 is compiled on the usual lines [cf. 35, p. 696].

Wolf (P. A.). **Sodium orthophenylphenate (dowicide A) combats microbiological losses of fruits and vegetables.**—*Down to Earth*, 12, 2, pp. 16–18, 5 figs., 1956.

The author reviews past studies on the fungistatic activity of dowicide A, with particular reference to control of *Penicillium digitatum* on citrus [35, p. 676], and lists some potential uses of this product with fruit and vegetables.

Chancogne (Mlle M.) & Viel (G.). **Méthodes d'évaluation des propriétés fongicides de substances diverses en vue de leur emploi agricole.** [Methods of evaluating the fungicidal properties of different substances with a view to their employment in agriculture.]—*Ann. Inst. Rech. agron.*, Sér. C (*Ann. Épiphyt.*), 7, 4, pp. 641–660, 1956.

This is a comprehensive account of a practical method used by the authors at the Laboratory of Phytopharmacy, Versailles, to assess the value of new fungicides, the principles of which have already been noticed [35, p. 110]. Spores of *Alternaria oleracea* [*A. brassicicola*] and *Glomerella cingulata* are chiefly used in the preliminary McCallan test [26, p. 206].

Vasil'evsky (A. P.) & Klimovich (I. V.). Применение препарата НИУИФ-2 (гранозана) в цветоводстве. [Use of the preparation NIUIF-2 (granosan) in horticulture.]—Бюлл. бот. Сада [*Bull. bot. Gdn, Moscow*], *1957*, 27, pp. 89–94, 1 fig., 1957.

Experiments at the Central Botanical Garden of the U.S.S.R. Academy of Sciences showed that NIUIF-2 (granosan) [36, p. 44] can be used effectively in horticulture. Wet seed treatment is carried out by submerging the seed in a

1 in 1,000 suspension for one to two minutes, while for dry treatment 2 to 4 gm. granosan are required per kg. seed. Gladiolus corms are submerged in a 1 in 50 suspension for 30 minutes, left to dry for 2 hours, and then planted. Curative treatment consists in watering seeds sown in a 55 by 30 cm. box with 400 to 550 ml. of the suspension before covering with soil, and again after covering but using only 100 ml.

For disinfecting heaps of humus soil it is first screened, then flat layers (5 to 6 cm. deep) are raked with granosan (2 to 3 gm. per kg. soil) and then left for four to five days when sand and turf or leaf mould are added. The treated soil should be of medium moisture content and at not less than 12° [C.] temperature. Summer and autumn months are, therefore, best for treating soil which is stored during the winter and then used in the spring for boxes and seed beds.

In one experiment steeping lucerne stems containing overwintering sclerotia of a species of *Botrytis* in a 1 in 500 suspension for 30 minutes was toxic to the sclerotia, none of which germinated, as against 24 in the water-treated control. Safety measures when handling the fungicide are indicated.

Arnold (E. W.) & Apple (J. W.). **The compatibility of insecticides and fungicides used for the treatment of Corn seed.**—*J. econ. Ent.*, 50, 1, pp. 43–45, 1957.

The results of laboratory tests at the Department of Entomology, University of Wisconsin, conducted by a procedure based on the Hoppe 'paper-doll' method (*Yearb. U.S. Dep. Agric.*, pp. 377–380, 1953) [31, p. 61], demonstrated that 1 oz. per bush. dieldrin, heptachlor, or aldrin [34, p. 45] did not impair the fungicidal action of normal dosages of captan, dichlone, or thiram against *Pythium* spp. when used as a combination slurry treatment on damaged maize seed. A combination of lindane [35, p. 502] and captan was also innocuous, but a significant reduction of germination resulted from the joint use of the insecticide with dichlone or thiram.

Stand count and yield data from a field experiment with injured seed failed to reveal any adverse effects of the insecticides on the fungicides. Used alone, dieldrin conferred a low degree of protection against the fungi. The outcome of bioassays with pomace flies (*Drosophila melanogaster*) showed that the insecticidal action of dieldrin was not weakened by association with captan, dichlone, or thiram.

Mendes (O.). **Resultados dos ensaios realizados no campo de ensaios da Secção de Fitopatologia.** [Results of tests performed in the experimental field of the Section of Phytopathology.]—*Gaz. Agric., Moçamb.*, 9, 93, pp. 34–41, 8 figs., 1957.

A tabulated survey is given of the results of experiments on the control of blight (*Phytophthora infestans*) in Up-to-Date 'seed' potatoes produced in the province of Tsetserra, Mozambique [35, p. 545], and on tomato, and of early blight (*Alternaria solani*) on the former host [loc. cit.]. Seven fungicides were tested against *P. infestans* on potatoes, nine treatments being given at 10-day intervals to begin with and every five days after the appearance of symptoms. Zineb at a strength of 200 gm. per 100 l. produced the heaviest yields and the largest financial profit. The same chemicals were used in the early blight trials (eight applications), and here again zineb gave the best results.

Zineb and captan at dosages of 20 gm. per 10 l. water, capex Bordeaux mixture (80), blitox (30), copper Sandoz and oxysul (copper oxysulphate), both at 40 gm., all gave absolute control of *P. infestans* on tomatoes when scattered over the seed-bed immediately after sowing and sprayed on the plants at five-day intervals after emergence, while mortality in the untreated plots reached 90 per cent. Captan, however, caused intensive scorching, resulting in the death of over half the plants. Severe infestation by nematodes prevented the critical evaluation of the same treatments applied after transplanting.

Baumann (Jutta). **Versuche zur Bekämpfung von Pilzkrankheiten im Feldfruchtbau mit der Organo-Zinn-Verbindung V.P. 1940.** [Experiments on the control of fungus diseases in field crops with the organo-tin compound V.P. 1940.]—*Pflanzenschutz*, 9, 3, pp. 44–47, 1957.

Experiments performed in 1956 on the control of beet and celery leaf spots (*Cercospora beticola* and *Septoria apii*) and potato blight (*Phytophthora infestans*) are reported from the Plant Protection Institute, Stuttgart-Hohenheim, Germany.

In one series of tests on Dobrovitz N sugar beet grown from naturally infected, untreated seed the field was also heavily inoculated with desiccated, infected leaves at the rate of 5 gm. per cu. m. Spraying was carried out on 26th June, 18th July, and 8th and 30th August, using V.P. 1940 at dosages of 1·8 and 3 kg. per ha. and the standard copper oxychloride at 4. The beet yields were raised from 269 double-centner [1 dc. = 100 kg.] per ha. in the control plots to 328, 377, and 422, respectively, in those sprayed with copper oxychloride and the two dosages of V.P. 1940, the corresponding figures for sugar being 32·1, 41·1, 54, and 61·5 dc., and for polarization 15·1, 15·4, 16·9, and 17·2 per cent., respectively. In another series on Kleinwanzlebener N, inoculation was omitted and natural infection did not occur until late in the season. The field was sprayed on 9th July, 7th August, and 9th September, using copper oxychloride and V.P. 1940 at the lower dosage only. Beet yields were raised from 450 to 469 and 472 dc. per ha., respectively, and sugar from 63 to 66 and 71.

In the potato blight trials (on the Bona variety) copper oxychloride (6 kg. per ha.), zineb (1·8), and V.P. 1940 (1·8 and 3) were applied on 2nd, 19th, and 26th July. The first signs of infection appeared in mid-June and by the time of the first treatment the disease had made rapid and uniform progress in the control plots. Yields were increased from 229 dc. per ha. to 249, 242, 263, and 258, respectively, by the four treatments, while tuber infection was reduced from 50 to 27 per 1,600 by V.P. 1940 at both concentrations, the other compounds being ineffectual.

S. apii developed on Magdeburger Markt celery while the plants were still in the cold frame and could not be entirely suppressed by six applications of 1 per cent. copper oxychloride. In the field root yields were raised from 132 to 166, 145, 245, and 273 dc. per ha. by six applications between 19th June and 14th September of copper oxychloride (6 kg.), zineb (3), and V.P. at the foregoing concentrations, the corresponding figures for foliage being 76, 98, 84, 149, and 168, respectively.

Čejp (K.). **Houby I.** [Fungi I.]—495 pp., 8 pl., 114 figs., Czechoslovakian Academy of Sciences Press, Prague, 1957. Kčs 43, 70.

This text-book, intended to help students in Czechoslovakia, covers the whole field of myxomycetes, phycomycetes, and ascomycetes, segregated into two main groups, the Myxomycophyta and the Mycophyta. Treatment is at the family level, with brief summaries of generic characters. Species are indicated mainly by the illustrations. A terminological glossary is supplied.

Parker-Rhodes (A. F.). **Distribution of fungi in a small wood.**—*Ann. Bot., Lond.*, N.S., 20, 78, pp. 251–264, 1956.

Records made from June, 1952, to December, 1954, of basidiomycetes in Madingly Wood, Cambridge, were analysed statistically. Of the 421 species identified, 24 were confined to certain parts of the wood, though they appeared to have spore dispersal mechanisms that should have ensured uniform distribution; they were mostly in the oldest part of the wood where the trees (mostly oak) were over 50 years old. It is concluded that the spore dispersal rates were very slow, insects probably playing an essential part in some. As many of these species are forest pathogens, the problem of dispersal mechanism is important.

Sussman (A. S.). **Physiological and genetic adaptability in the fungi.**—*Mycologia*, 49, 1, pp. 29–43, 1957.

In this paper, presented as part of a symposium, 'Some Contributions of Research in Microbiology to Fundamental Biological Problems', before the Mycological Society of America and the Microbiological Section of the Botanical Society of America, at Storrs, Connecticut, on 29th August, 1956, the author, after defining the term 'adaptability', discusses some physiological and genetic aspects of adaptation in fungi, with special reference to the parts played by the cell surface, the cytoplasm, and the nucleus. A list of 83 references is appended.

Christensen (J. J.) & De Vay (J. E.). **Adaptation of plant pathogen to host.**—*Annu. Rev. Pl. Physiol.*, 6, pp. 367–392, 1955. [Received 1957.]

The main headings in this review of 67 contributions to the literature are: variability of disease expression in relation to environment; influence of artificial substrates on the virulence of plant pathogens; mixtures of biotypes in culture; competition for survival among races of plant pathogens; heterocaryosis and nuclear dissociation; effect of the host on sporulation and cultural characters; changes in the virulence of plant pathogens on their hosts. The authors conclude that the evidence available clearly indicates that the virulence of a pathogen may be maintained, increased, or diminished by sojourn of the pathogen on or in a host.

Walker (J. C.) & Stahmann (M. A.). **Chemical nature of disease resistance in plants.**—*Annu. Rev. Pl. Physiol.*, 6, pp. 351–366, 1955. [Received 1957.]

The chief consideration in this discussion (with 59 references to the literature) is given to instances in which there are clear differences between varieties in their resistance to a given pathogen. The basis of the specific pathogenicity of each fungal form for a particular host group still remains to be determined, though a contribution to this problem has already been made by Winstead and Walker [33, p. 748].

Moreau (C.). **Les maladies parasitaires des principales cultures coloniales. Revue bibliographique. XVIII.** [The parasitic diseases of the principal colonial crops. A bibliographical review. XVIII.]—*Rev. Mycol., Paris*, 21, *Suppl. colon.* 2, pp. 125–144, 1956.

Further notes in this series [cf. 36, p. 414] are based on world literature published from 1953 to 1956 (173 titles).

Dimond (A. E.). **Pathogenesis in the wilt diseases.**—*Annu. Rev. Pl. Physiol.*, 6, pp. 329–350, 1955. [Received 1957.]

The author reviews and discusses recent contributions (105 references) to the subject of pathogenesis in wilt diseases of plants. The view that varied pathogens, growing in many hosts, produce wilt diseases through a limited number of biochemical mechanisms is presented in terms of diseases caused by *Fusarium oxysporum* and *Verticillium*. Two brief introductory sections dealing, respectively, with (*a*) invasion of the host and symptom development and (*b*) evidence on the origin of epinasty and related symptoms, are followed by sections on the interrelations of the dominant symptoms; the cause of desiccation symptoms in leaves; the cause of vascular discoloration; mechanisms to account for wilting and discoloration; and wilt pathogenesis: a synthesis.

Miller (L. P.) & McCallan (S. E. A.). **Toxic action of metal ions to fungus spores.**—*J. agric. Fd Chem.*, 5, 2, pp. 116–122, 2 graphs, 1957.

The results of quantitative studies on the interactions between metal ions and

spores of the representative fungi, *Aspergillus niger*, *Alternaria oleracea* [*A. brassicicola*], *Neurospora sitophila*, *Monilia* [*Sclerotinia*] *fructicola*, and *Venturia pirina* [cf. 35, p. 471], are reported from the Boyce Thompson Institute for Plant Research, Yonkers, New York.

Silver is taken up so rapidly that germination can be completely inhibited after a contact period of one minute or less. Only mercury, and to a lesser extent copper, offer serious competition. The toxicity of silver is unaffected by chloride but reduced by bromide and prevented by iodide. The metal exerts a strong effect on the permeability of spores as measured by the outward movement of phosphorus compounds from cells labelled with phosphorus-32. Copper, zinc, and cadmium reduce germination appreciably only after some hours of operation on the spores. About 75 per cent. of the zinc content of spores cultured in the presence of zinc-65 is exchanged with non-radio-active zinc within 10 minutes. It is concluded, therefore, that inward and outward movement of various materials occurs much more readily with fungus spores than was hitherto supposed.

Ingold (C. T.). **Spore liberation in higher fungi.**—*Endeavour*, 16, 62, pp. 78–83, 1 pl., 8 figs., 1957.

This review of recent studies on the production and liberation of spores by the higher fungi [33, p. 103] deals in particular with *Ganoderma applanatum* and *Daldinia concentrica*.

Wright (Joyce M.). **The production of antibiotics in soil. IV. Production of antibiotics in coats of seeds sown in soil.**—*Ann. appl. Biol.*, 44, 4, pp. 561–566, 1956.

In further studies at Imperial Chemical Industries, Ltd., Welwyn, an attempt was made to induce the production of gliotoxin and other antibiotics in seeds sown in a normal soil by inoculating them with spores of fungi or cultures of actinomycetes known to produce antibiotics *in vitro* [cf. 36, p. 338]. The seeds (white mustard, Victor wheat, and Meteor pea) were inoculated by shaking them with sporulating fungal cultures or soaking in suspensions of the actinomycete cultures, and air-dried before sowing. After a germination period of six or seven days the coats were removed from the mustard and pea seeds and were extracted; with wheat the whole seed was used. The extracts were tested for antibiotic activity and the antibiotics identified by paper chromatography.

The results showed that extracts of the coats of mustard, wheat, and pea seeds inoculated with *Trichoderma viride* and of pea seeds inoculated with *Penicillium frequentans* or *P. gladioli* and sown in soil contained gliotoxin, frequentin, and gladiolic acid, respectively. *Streptomyces griseus*, *S. venezuelae*, and *S. aureofaciens* failed to produce an antibiotic in the coats of pea seeds sown in John Innes potting compost or a calcareous soil, but when uninoculated pea seeds were sown in similar soil in which a gliotoxin-producing strain of *T. viride*, not previously introduced, was growing vigorously, gliotoxin was later found in the seed coats, thus demonstrating for the first time the production of a known antibiotic in an unsterilized soil by a member of its natural microflora.

Gliotoxin production in the coats of seeds inoculated with *T. viride* could not be detected for at least three days after inoculation; production reached a maximum in six days, then declined, and would, therefore, be effective only against early pathogenic attack on the seedlings.

Verona (O.) & Gambogi (P.). **Intorno all'azione antimicotica della nistatina. I. Azione su Aspergilli, Penicilli e funghi fitopatogeni.** [On the antifungal action of nystatin. I. Action on *Aspergillus*, *Penicillium*, and phytopathogenic

fungi.]—*Ann. Sper. agr.*, N.S., 11, 1, pp. 193–209, 8 figs., 1 graph, 1957. [English summary.]

In experiments at the Institute of Plant Pathology and Agricultural Microbiology, University of Pisa, Italy, nystatin, an antibiotic substance present in the mycelium of *Streptomyces noursei* (E. L. Hazen & R. Brown, *Proc. Soc. exp. Biol., N.Y.*, 76, p. 93, 1951), used in the form of a therapeutic preparation mycostatin (Messrs. Squibb, Rome), stated by the manufacturers to exert an activity of about 2,300 U. per mg., retarded or inhibited the growth of 24 species of *Penicillium* and 11 of *Aspergillus*, as well as of numerous phytopathogenic fungi, including *Endothia parasitica* (highly sensitive), *Sclerotium rolfsii*, *Ustilago zeae* [*U. maydis*], and *Diplodia malorum* Earle. *Penicillium* spp. were, in general, more susceptible than *Aspergillus* spp. The antibiotic appeared to be more fungistatic than lethal; nevertheless, it gave satisfactory control of a natural infection of potted clover seedlings caused by *Pythium* sp.; of a slight mouldiness [unspecified] of gladiolus bulbs; and of an experimental infection of detached vine branches by *Botrytis cinerea*. It did not appear to be toxic to the aerial parts of plants. Application via the roots growing in solutions in some cases slightly retarded the growth of the underground parts and (when the applications were heavy) of the aerial parts; on plants growing in soil it had no adverse effect, even stimulating growth at first. The antibiotic was found to be retained by soil.

Rehm (H.-J.). **Untersuchungen über Hemm- und Förderungsstoffe aus Streptomyceten der Streptomyces albus-Gruppe.** [Studies on inhibitory and stimulatory substances from streptomycetes of the *Streptomyces albus* group.]—*Zbl. Bakt.*, Abt. 2, 109, 13–19, pp. 399–412, 3 pl., 2 graphs, 1956.

Further studies at Gatersleben [33, p. 446] revealed the presence, in organisms of the *Streptomyces albus* group, of three physiologically active substances. The first was an antibiotic which diffused from the mycelium but could not be detected within it. This was associated with another which promoted growth in *Aspergillus niger* [see next abstract], and which was most probably a breakdown product of the antibiotic. A third substance, which was found to accumulate within the mycelial wall and was seemingly produced there, appeared to be identical with the second, indicating this to be probably both a precursor and a breakdown product of the antibiotic.

Rehm (H.-J.). **Über die Beziehungen zwischen Aspergillus niger und Streptomyceten der Streptomyces albus-Gruppe.** [On the relationship between *Aspergillus niger* and streptomycetes of the *Streptomyces albus* group.]—*Zbl. Bakt.*, Abt. 2, 109, 13–19, pp. 413–415, 3 pl., 2 figs., 1956.

The author has reported a marked stimulation of the growth of *Aspergillus niger* when overgrowing colonies of *Streptomyces albus* [see preceding abstract]. The present paper describes the interaction of the two organisms, which suggests that *A. niger* is initially dominant and obtains nutrients and a growth-promoting factor [loc. cit.] from the streptomycete, though lysis of the streptomycete mycelium at this stage could not be demonstrated. After sporulation by *A. niger*, however, and increased formation of antibiotic by the streptomycete, the latter in turn becomes the parasite.

Bustinza (F.). **Nota sobre la actividad antibiótica del Penicillium piceum Raper-Fennell (estirpe Bz-Ia).** [A note on the antibiotic activity of *Penicillium piceum* Raper & Fennell (strain Bz-Ia)].—*An. Inst. bot. A. J. Cavanilles* (formerly *An. Jard. bot. Madr.*), 14 (*1955*), pp. 19–21, 2 figs., 1956.

The author has isolated from soil a strain of *Penicillium piceum* [*Mycologia*, 40, pp. 507–546, 1948] with antibiotic activity against various bacteria.

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AUTHORS' NAMES

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